MAINTENANCE SERVICE MANUAL FT-208R

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CONTENTS

PREFACE

The purpose of this manual is to provide the reader with information critical to the maintenance and repair of the FT-208R transceiver, as well as information useful for understanding its functions and operation more thoroughly. Technical explanations are geared toward providing a clear understanding of the overall system design, rather than attempting to cover many specific circuit details. Therefore descriptions have been kept brief, although photographs and drawings are utilized liberally.

Use of this manual is entirely at the owner's risk. The FT-208R uses high quality components and a design and construction intended to last a long time without the need for alignment or servicing. Should the reader discover any errors in this manual, however, we invite any corrections; although Yaesu can not assume liability for damage which may occur when this manual is used as a reference.

Your attention to the note below is requested.

Yaesu Musen Company, Ltd.
Tokyo

SECTION 1—GENERAL

FT-208R

MICROPROCESSOR CONTROLLED 2 METER BAND FM HAND-HELD TRANSCEIVER



GENERAL DESCRIPTION

The FT-208R is an all new microprocessor-based 2m FM transceiver for the demanding amateur operator. Featuring 2.5 watts of RF output, the FT-208R provides 4 MHz (2 MHz) coverage in 5 kHz or 10 kHz (12.5 kHz or 25 kHz) steps, along with 10 memories for storage of favorite channels.

The microprocessor-controlled scanner allows sweeping of the band with automatic holding on busy or clear channels. Scanning of the 10 memories may also be selected. An important new feature in the FT-208R is the limited band scanning mode, whereby a favorite segment of the band may be scanned, instead of the entire band. The FT-208R may also be programmed via the keyboard to exclude a given section of the band, if desired.

Digital display of the last four digits of the operating frequency is provided by a Liquid Crystal Display. A nighttime display illumination lamp is provided, along with a lithium cell for memory backup. The lithium cell has an estimated lifetime of approximately five years. The front panel keyboard allows entry of all channels, up/down scanning and repeater split programming, as well as two-tone (DTMF) encoding for autopatch or control purposes.

We encourage you to read this manual in its entirety, so as to become more familiar with the fantastic new FT-208R. With proper care, this equipment will provide many years of reliable performance.

SPECIFICATIONS

GENERAL

Frequency coverage:
144.000–147.995 MHz (Model A, D, E)
144.000–145.9875 MHz (Model B)
144.000–147.9875 MHz (Model C)

Number of channels:
800 5 kHz steps (Model A, D, E)
320 12.5 kHz steps (Model C)
160 12.5 kHz steps (Model B)

Emission type:
F3

Batteries:
Ni-Cd battery pack FNB-2

Voltage requirement:
10.8 VDC (maximum 13V)

Current consumption:
RX 150 mA (20 mA squelched)
TX 700 mA (HI), 350 mA (LOW)

Case dimensions:
168 (H) x 61 (W) x 49 (D) mm

Weight:
(with battery pack, rubber antenna)
720 g Approx.

Specifications subject to change without notice or obligation.

TRANSMITTER

Power output:
2.5 watts (HIGH)
300 mW (LOW)

Deviation:
±5 kHz

Spurious radiation:
–60 dB or better

Microphone:
Condenser type, 2000 ohm impedance

Selectivity:
±6 kHz at –6 dB
±12 kHz at –60 dB

Audio output:
500 mW at 10% THD

RECEIVER

Circuit type:
Double conversion superheterodyne

Intermediate frequencies:
1st IF = 16.9 MHz
2nd IF = 455 kHz

Sensitivity:
Better than 0.25 μV for 12 dB SINAD
Better than 1 μV for S/N 30 dB

MODEL	FREQUENCY RANGE (MHz)	PRESET FREQUENCY (MHz)	FREQUENCY STEP (kHz)	REPEATER SHIFT (kHz)	TONE BURST (Hz)
A	144.000–147.995	147.000	5/10	±600	–
B	144.000–145.9875	145.000	12.5/25	±600	1750
C	144.000–147.9875	145.000	12.5/25	±600	1750
D	144.000–147.995	145.000	5/10	±600	1750
E	144.000–147.995	147.000	5/10	±600	1750 (1800)
F (see NOTE)	144.000–145.990	145.000	10/20	–	–

FT-208R MODEL CHART

NOTE: Model F is for use in Japan only, and cannot be readily converted to other Models.

SEMICONDUCTOR COMPLEMENT

ICs:

HD44820A07	1
MC3357	1
MC14069UB	1
TC5082	1*
TP0401	1
μPC577H	1
μPD2819C	1
MK5087	1

FETs:

2SK184Y	1
2SK192Y	1
2SK193K	3

Transistors:

2SA950Y	2
2SA1175E	3
2SC2053	1
2SC2512	1
2SC2120Y	2
2SC2196	1
2SC2549	1
2SC2785E	10
2SC2786L	9
2SC2787L	3

LCD Display:

HI301	1

Diodes:

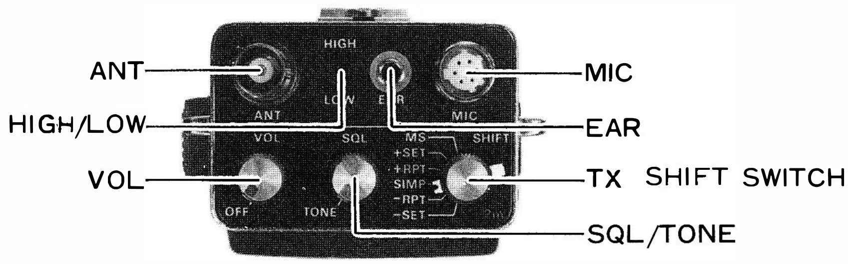
1S1555 (Si)	1
1SS53 (Si)	15
U05B (Si)	1
1SS97 (Schottky Barrier)	1
1SV69(Varactor)	6
1T25 (Varactor)	1
FC53 (Varactor)	1
MV11(Varistor)	1
MV103(Varistor)	1
HZ6B-1L (Zener)	1
HZ7A-2 (Zener)	1
HZ7B-1L (Zener)	1
SG235D (LED)	1
SR535D (LED)	1

*Model B, C, D, E only

ACCESSORIES AND OPTIONS

YHA-14	Rubber Whip Antenna	(Q3000005)
FNB-2	Ni-Cd Battery Pack	(Q9000088)
	Carrying Case (Vinyl)	(R7068220)
	Shoulder Strap with Ring	(R7048792B)
	Earphone	(M4190001)
YM-24A	Remote Speaker/Microphone	(D1000004A)
NC-9B	Ni-Cd Battery Charger (117 V)	(D3000082)
NC-9C	Ni-Cd Battery Charger (220/234 V)	(D3000083)
FBA-2	Battery Pack Charger Adapter	(A950001-Z)
FTS-32	Tone Squelch Unit	(D3000091)
MMB-10	Mobile Bracket	(D6000020)

TOP PANEL CONTROLS AND SWITCHES



VOL

This is the main volume and power ON/OFF switch for the transceiver.

SQL/TONE

The squelch control silences the receiver audio until a signal is received. When rotated to the TONE position, this switch will activate the optional Tone Squelch Unit, FTS-32, which provides silent monitoring of busy channels.

MIC

This connector accommodates the optional YM-24A Remote Speaker/Microphone.

ANT

The ANT jack is a BNC type connector for quick connection of the rubber flex antenna or an external antenna.

EAR

This is a miniature phone jack used to accommodate an external earphone.

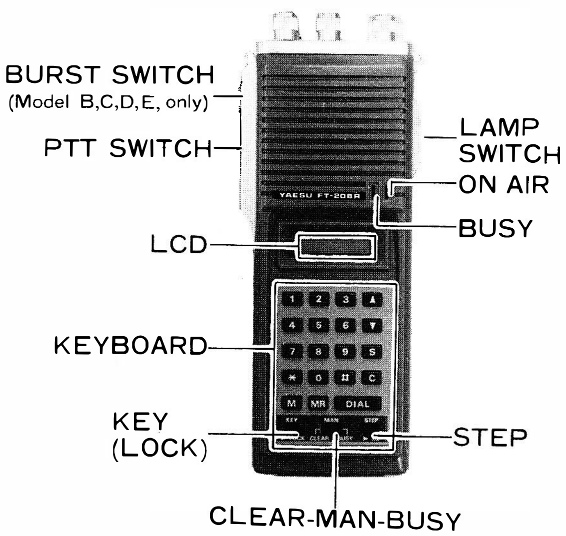
HIGH/LOW

This switch selects transmitter powers of 2.5 watts RF output or 300 mW of RF output.

SHIFT

This switch selects the repeater transmit frequency offset desired. In the SIMP position, the transmit and receive frequencies are the same. Shifts of ±600 kHz and auxiliary splits (±SET) can be selected. When set to the MS position, you will receive on the memory channel selected, while transmission will occur on the dial frequency. See the "Operation" Section for details.

FRONT PANEL SWITCHES



PTT Switch

The Push-To-Talk switch activates the transmitter. Release the switch for receiver recovery.

TONE BURST Switch (Model B, C, D, E only)

When the TONE BURST switch is squeezed along with the PTT switch, a 1750 Hz tone will be superimposed on the transmitted signal. The repeater access tone is manually actuated; the tone signal length can thus be controlled by the operator.

LAMP Switch

This switch activates the LCD illumination lamp (for nighttime operation).

ON AIR

This indicator lights while you are transmitting.

BUSY

This indicator lights when the main receiver squelch is opened up by an incoming signal.

KEYBOARD

On receive, the keyboard controls frequency programming, up/down scanning, and setting of auxiliary repeater splits. On transmit, the keyboard becomes a 16 button dual-tone multi-frequency encoder for autopatch or control purposes.

KEY

This control disables the keyboard, so as to prevent accidental frequency change caused by inadvertent bumping of one of the buttons on the keyboard. When the keyboard is in the "LOCK" mode, the letter "L" will be shown on the display.

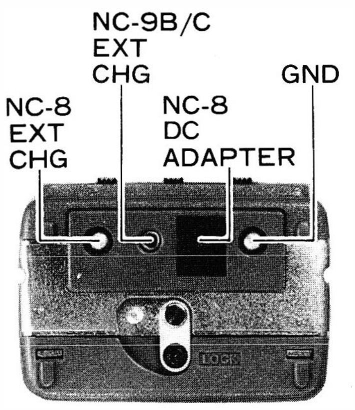
BUSY-MAN-CLEAR

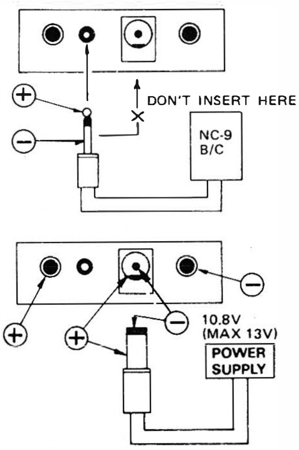
This switch selects the STOP mode of the scanner.

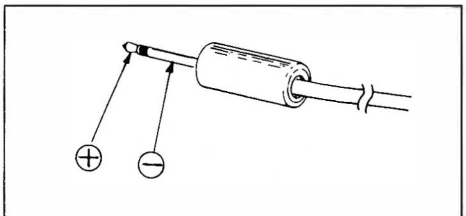
STEP

This switch selects the desired synthesizer step. When this switch is set to the X2 position, 10 kHz (25 kHz) steps are programmed. When not in the X2 position, 5 kHz (12.5 kHz) steps are programmed.

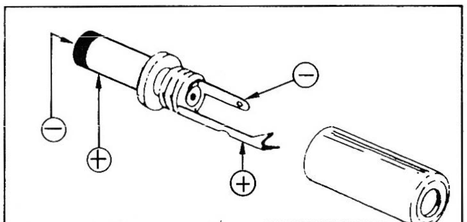
BOTTOM PANEL CONNECTIONS







NC-9B/C CHARGE PLUG CONNECTIONS



EXTERNAL DC POWER PLUG CONNECTIONS

EXT CHG (Jack)

This jack is used for connection to the external NC-9B/C Ni-Cd charger (optional).

EXT CHG (Terminal)

This terminal is for use with the NC-7 and NC-8 chargers (optional).

EXT DC (DC Adapter)

This jack accommodates an external DC power supply. When a plug is inserted, the Ni-Cd battery is automatically switched off.

CAUTION

Never attempt to insert the charge plug from the NC-9B/C or other metal material into the DC adapter jack on the bottom of the FT-208R, as the internal protection fuse **will blow.**

INSTALLATION

ANTENNA CONSIDERATIONS

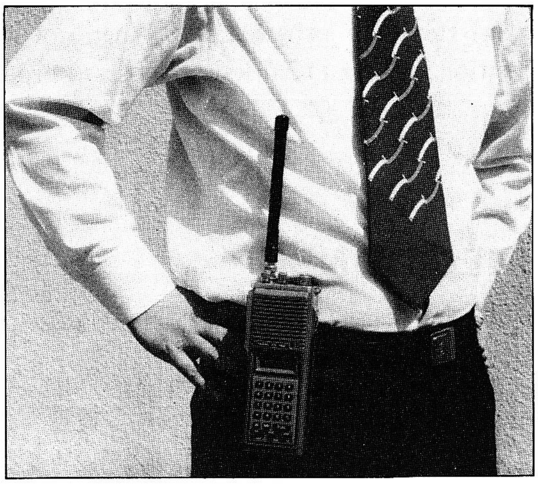
The FT-208R comes equipped with a helical rubber flexible antenna, which should be sufficient for local work through repeaters, etc. Different types of antennas may be connected to the top panel BNC connector.

The external antenna should have an impedance of 50 ohms, and should be fed with good quality cable. If your current antenna has a connector which differs from the BNC type, consult your dealer regarding the purchase of a suitable adapter.

For base station use, gain antennas such as the yagi, quad, stacked vertical, etc., will enhance long distance communications. These antennas are also available from most Yaesu dealers.

CAUTION

NEVER SQUEEZE THE PUSH TO TALK SWITCH WITHOUT HAVING AN ANTENNA CONNECTED TO THE TOP PANEL ANTENNA JACK.



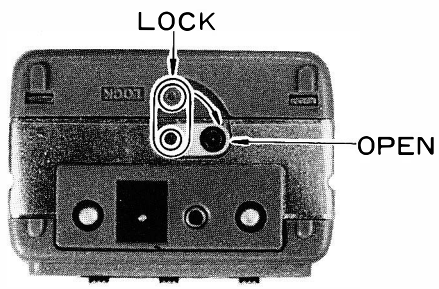


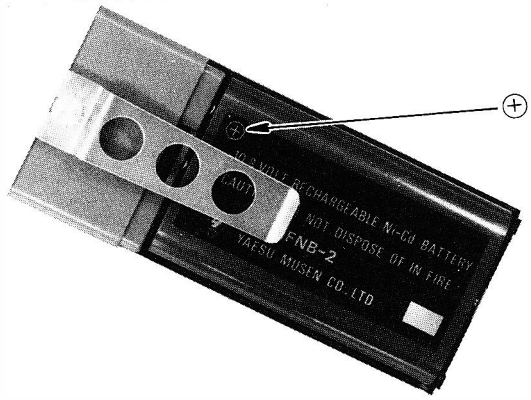
BATTERY PACK INFORMATION

The FNB-2 Ni-Cd battery pack is a 10.8 volt 450 mAh pack designed expressly for the FT-208R. We do not recommend the use of other brands of battery packs. Before removing the battery pack be sure to remove the charger plug from the transceiver. Never apply AC power of any kind, nor DC voltages above 13 volts, as these types of abuse will void any factory warranties.

The following procedure will allow quick changing of battery packs.

1. Turn the battery compartment cover lock.
2. Remove the battery compartment cover.
3. Remove the discharged battery pack, and install the new pack in the correct manner. Be certain the + mark is in the upper right hand corner, as shown below.
4. Replace the battery compartment cover, and be sure the cover is locked into place.
5. When operating in remote areas, always be sure to carry at least one extra battery pack, so as not to be without communications in the event of an emergency.





BATTERY CHARGER INFORMATION (OPTION)

NC-7

The NC-7 is a battery charger for base stations, designed to match the FT-208R. A completely discharged FNB-2 battery pack can be charged in 15 hours, using the NC-7. While charging the battery pack with the NC-7, the FT-208R cannot be used.

NC-8

The NC-8, designed for the FT-208R, is a battery charger/DC adapter with three different charging modes: QUICK, STANDARD and TRICKLE. Any of these modes may be selected according to your battery condition and the desired charge time. The QUICK mode charges the battery in approximately 4 hours, the STANDARD mode in 15 hours, and the TRICKLE mode may be used to protect the battery from self-discharge when the battery is completely charged.

The DC adapter function of the NC-8 can be used to operate your FT-208R, while saving battery consumption. During operation with the DC adapter, the charger function can also be activated.

FBA-2

This battery sleeve is designed to charge the FNB-2 battery pack, using either the NC-7 or NC-8. It is especially convenient when you charge an extra battery pack while using your transceiver.

NC-9B/C

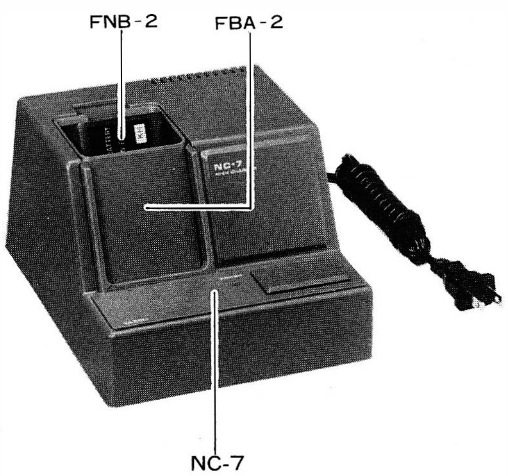
The NC-9B/C is a compact charger to charge the FNB-2 battery pack while installed in the FT-208R. The approximate time required for a completely discharged battery is 15 hours.

PA-3

The PA-3 is a DC-DC adapter for use with the FT-208R when operating your transceiver from a car. The PA-3 allows you to operate the FT-208R while conserving battery charge, and the trickle charger function also protects the battery pack from self-discharge.
(Use only with 12 V negative ground cars.)



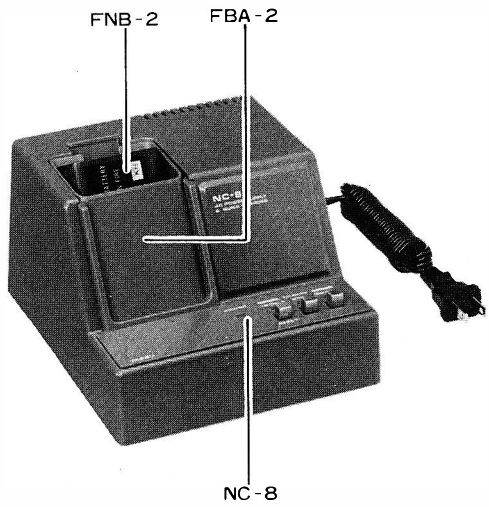
NC-7/FT-208R



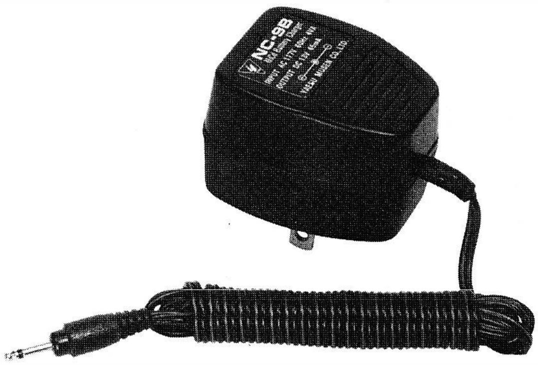
NC-7/FBA-2/FNB-2



NC-8/FT-208R



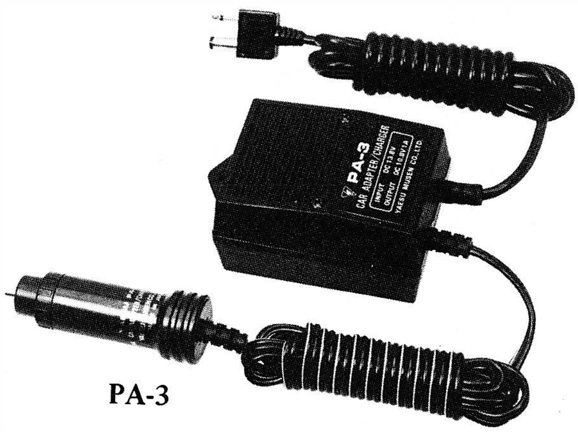
NC-8/FBA-2/FNB-2



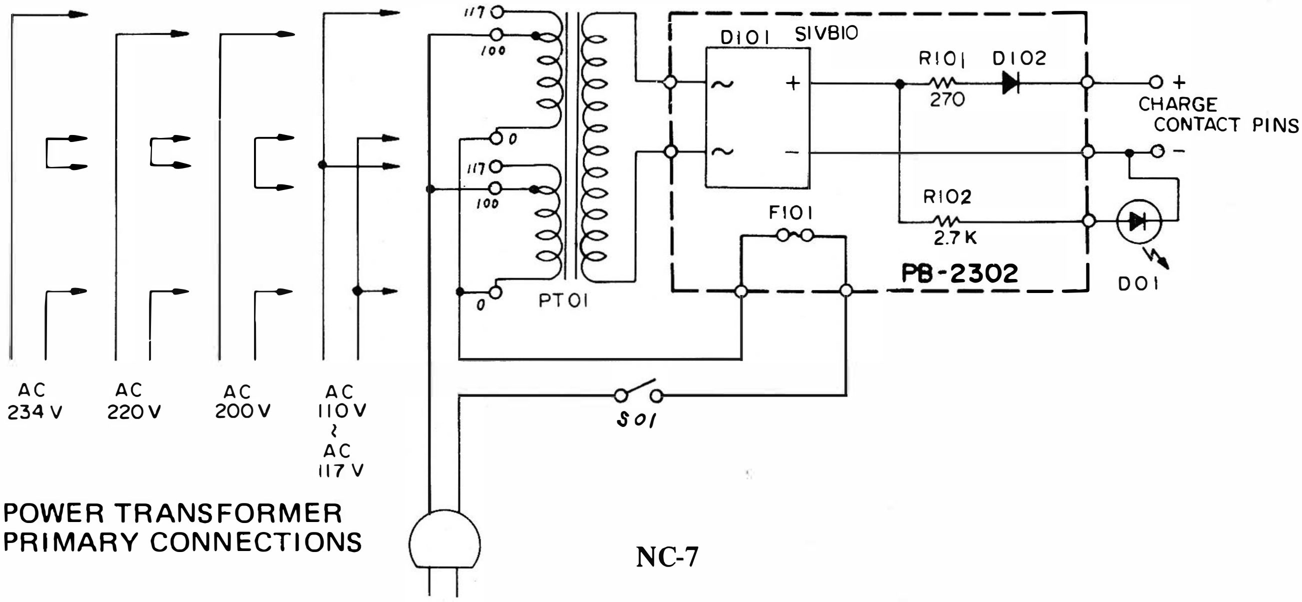
NC-9B (for 117V AC)



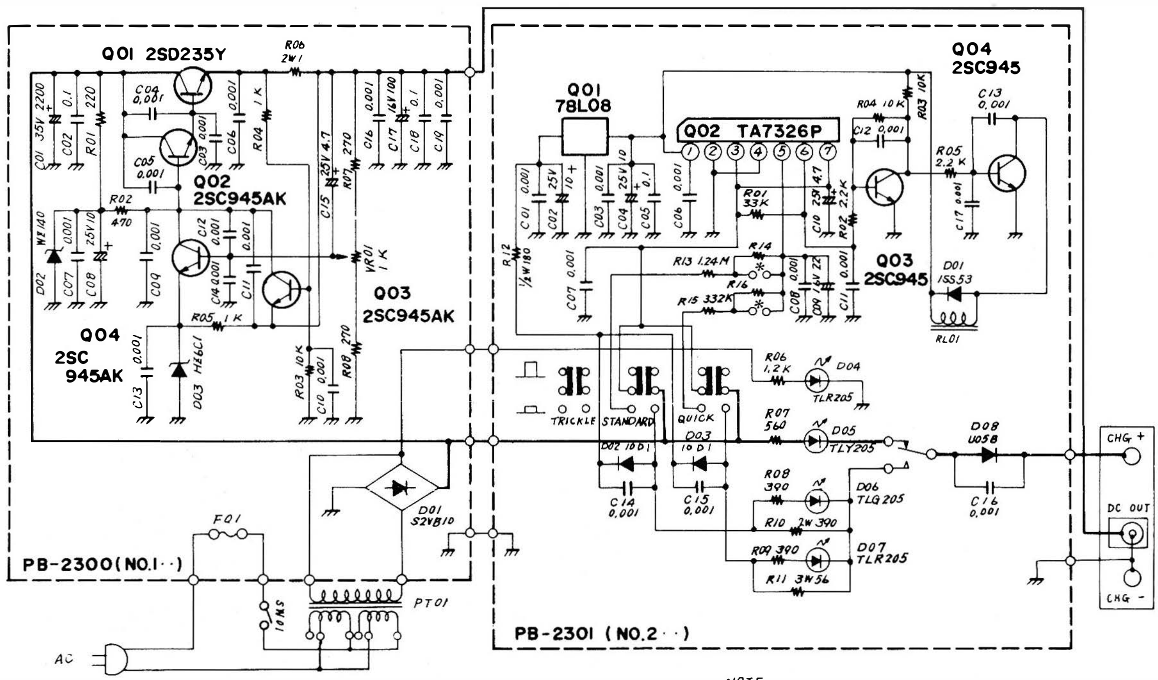
NC-9C (for 220–234V AC)



PA-3

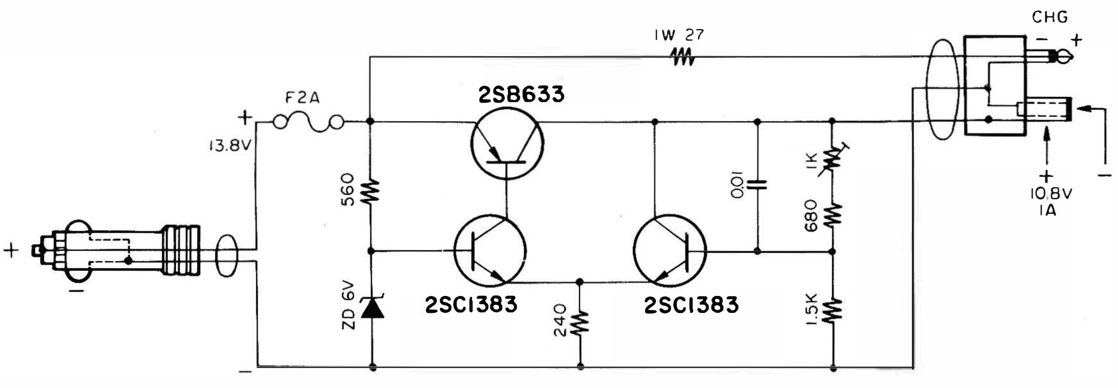


NC-7



NC-8

NOTE
ALL CAPACITORS ARE IN μF.
* ADDING RESISTOR IN PARALLEL CHANGES TIME CONSTANT.



PA-3

YM-24A EXTERNAL SPEAKER/MICROPHONE (OPTION)

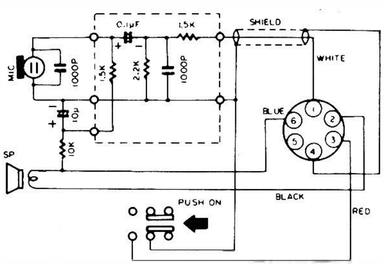
An external speaker/microphone may be attached through the top panel microconnector.

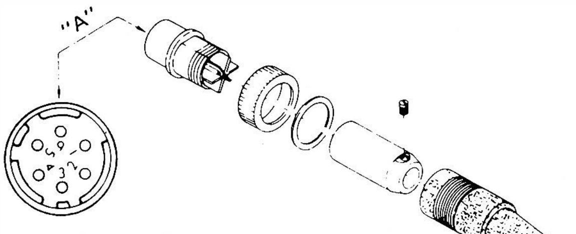
The microphone should have an impedance of 2000 ohms. See your Yaesu dealer for details of the YM-24A Remote Speaker/Microphone.

Once installed, the YM-24A can be held close to your ear during reception, allowing you to raise your FT-208R high above any obstructions. On transmit, hold the microphone near your mouth, and squeeze the switch on the microphone. Release the switch to resume reception.



The YM-24A Speaker/Microphone option adds versatility to your Yaesu transceiver.





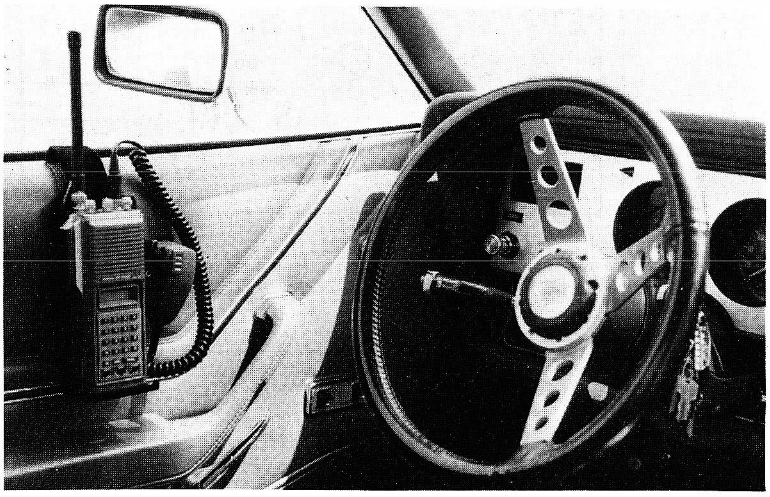
Viewed from "A" side

YM-24A Speaker/Microphone Connections

MMB-10 MOBILE BRACKET (OPTION)



MMB-10/FT-208R



FT-208R/YM-24A/MMB-10

OPERATION

A. Basic Operation

1. Preset the controls and switches as follows:

SHIFT	SIMP position
VOL	OFF position
SQL	Position just before the click-stop
KEY	UNLOCK (left) position
CLEAR-MAN-BUSY	
	MAN position
STEP	X1 (left) position
BACKUP	ON position (located in the battery compartment) See page 1-14

2. Make certain that the battery pack is correctly installed and that the antenna has been properly connected.
3. Turn the VOL control clockwise out of the click-stop position. The digital display will indicate "7.000" meaning 147.000 MHz (Model B, C, D "5.000" = 145.000 MHz). Gradually rotate the VOL control for a comfortable level on the background noise or incoming signal.
4. When the channel is clear, rotate the SQL control clockwise until the background noise is just silenced. If you go beyond this threshold point the receiver will not respond to weak signals.
5. Squeeze the push-to-talk (PTT) switch to transmit. Release the PTT switch for receiver recovery. If your FT-208R (Model B, C, D, E) is equipped with a tone burst switch, press this switch, along with the PTT switch, to transmit a 1750 Hz tone to access repeaters.

B. Entering Frequencies from the Keyboard

[Model A, D, E]

1. When a frequency is programmed from the keyboard, the last four digits of the operating frequency must be entered. This frequency must be divisible by 5 kHz (e.g., 5.325, 5.350, etc.).
2. To enter 146.025 MHz, press "6025" on the keyboard. The digital display will now show these digits. Now press the DIAL key, and the decimal point will appear between the "6" and the "025". You are now operating on 146.025 MHz.
3. Let's try another example: To operate on 147.725 MHz, press "7725" and DIAL.

[Models B and C]

1. When a frequency is programmed from the keyboard, the four digits above 1 kHz must be entered. This frequency must be divisible by 12.5 kHz. [Example: 5.012(5), 5.500(0)].
2. To enter 145.0125 MHz, press "5012" on the keyboard. The last digit of "5" does not have to be entered. Now press the DIAL key, and the decimal point will appear between the "5" and the "012", with a small "5" displayed after the "012".

   You are now operating on 145.0125 MHz.
3. Let's try another example: To operate on 145.1875 MHz, press "5187" and DIAL, and the display will show 5.1875.

C. Entry and Recall of Memory Channels

1. To store a frequency in memory, the desired frequency is first entered on the display. Then press the desired memory channel number, 0 to 9, and then press M. Now the frequency is stored in the memory.
2. To store 145.475 MHz in memory channel 1, press "5475", DIAL, "1", and then "M".
3. Now store another frequency in memory channel 2. For example, to store 145.125 MHz press "5125", "DIAL", "2", and then "M".
4. Now memory channels 1 and 2 have been programmed. If you desire additional memory channels, store the frequencies in the same manner described in Steps 2 and 3.
5. To recall a memory channel, push the desired memory channel number (0 to 9) and then "MR". For example, to recall the frequencies stored in the above examples, first press "1" and then "MR". The digital display will show "5.475", which is the frequency stored in memory channel 1. To recall memory channel 2, press "2" and then "MR". The display will then show "5.125". If other memory channels have been stored, press the corresponding channel number and "MR", and the digital display will show the desired frequency.

6. To return to the dial frequency (the last frequency displayed before the DIAL button was pushed), press "DIAL", and the display will return to 5.125, unless other frequencies were stored in the memory channels during Step 4. If you wish to operate on frequencies other than the memory channel, press the keys for the desired frequency and "DIAL". The display will then show the frequency and allow operation on that frequency. For example, press "5775" and "DIAL" to operate on 145.775 MHz

D. Priority Channel Operation

1. First enter into the memory channels all desired frequencies for priority use.
2. Now enter another frequency onto the dial. In this example, we will use 145.500 MHz. Press "5500" and "DIAL". The display will show "5.500".
3. Now recall any of the stored memory channels. For example, as 145.125 MHz was previously stored in memory channel 2, press "2" and "MR" to recall that frequency. Now press the "#" key. The display will indicate "5.500 P", and every few seconds the display will switch to the memory channel "5.125".
4. When the CLEAR-MAN-BUSY switch is in the BUSY position, the transceiver will lock on the memory channel if a carrier is present when the channel is checked by the priority search feature. If you place the CLEAR-MAN-BUSY switch in the CLEAR position, the search will stop when the memory channel is clear (no signal is present). To reinstate priority operation, repeat step 3.
5. To use different memory channels with priority channels, enter the priority frequency from the keyboard and press "DIAL". Now press the number of the desired memory channel for recall, and then press "#". The transceiver will search the memory channel from the dial frequency every few seconds.

E. Repeater Operation

1. Repeater shifts of +600 kHz and −600 kHz are built into the FT-208R. To select the shift frequency, set the SHIFT switch to either the +RPT or −RPT position.
2. When nonstandard repeater shifts (other than ±600 kHz shifts) are required, the repeater shift can be programmed from the keyboard. For example, to program a split of ±700 kHz, push "0700" and then the "S" key. Now the repeater shift is programmed. Set the SHIFT switch to the +SET position, and close the PTT switch. The display will indicate the frequency that is +700 kHz from the receive frequency. If the SHIFT switch is in the −SET position, the transmit frequency will be −700 kHz from the receive frequency. (See page 1-13 Error Modes)

F. Split Operation

1. To transmit on the dial frequency and receive on one of the memory frequencies, set the SHIFT switch to the MS position, and enter the desired transmit frequency from the keyboard.
2. Now recall the desired memory channel for receive. Close the PTT switch, and the display will indicate the **dial** frequency during transmission. Release the PTT switch to return to the receive mode (on the memory channel).

G. Scanner Operation

1. With the CLEAR-MAN-BUSY switch in the MAN position and the STEP switch in the X1 position (left side), press the UP ▲ or DOWN ▼ switch to move 5 kHz (12.5 kHz) up or down, respectively. If you push and hold the UP or DOWN switch for more than 1 second, the scanner will be activated.
2. To stop the scan, press the UP, DOWN, or PTT switch. If you hit the PTT switch while scanning, no transmission will occur. Release the PTT switch momentarily, then press the PTT switch again to transmit.
3. To stop the scanner on a busy or clear channel, place the CLEAR-MAN-BUSY switch to the desired position, and press the UP or DOWN switch for a moment. The scanner will search until a busy or clear channel is found. After a 5 second stop on the channel for monitoring, the scanner will again start to search other channels. If you wish to stop on a channel, momentarily close the PTT switch.

4. To scan only the memory channels, press the MR switch, and then either the UP or DOWN switch. The scanner will search all ten memory channels. Press the PTT switch on the channel you wish to remain on. You may choose the desired scan mode as described in the above steps.

H. Limited Band Scanner Operation

1. To scan between a dial frequency and one of the memory channels, enter the desired starting frequency from the keyboard, and then recall the memory frequency and press the "#" key. The priority function will then be activated. Now, press either the UP or DOWN switch. If UP is pressed with the CLEAR-MAN-BUSY switch in the MAN position, the display will scan from the dial frequency to the memory channel continuously. If the CLEAR-MAN-BUSY switch is placed in the BUSY position, the scanner will stop at a channel where a carrier is present, and start scanning again after 5 seconds.
2. For example, enter 145.750 into memory channel 1, and press "4750". Next, press "DIAL", "1", "MR" and finally "#". The priority function will then be activated. When the UP switch is pressed, the transceiver will scan up to "5.750", and then the display will jump back to 144.750 MHz, continuing the scan up to 145.750 MHz again.
3. If the DOWN key is pressed instead, the display will scan from 144.750 MHz to the low band edge of "4.000" and then jump to the high band edge of "7.995 (5.9875, 7.9875)". From this band edge, the scanning moves to the memory frequency of "5.750", and then jumps to the dial frequency of "4.750", **omitting** the frequencies in between. This scanning function will repeat itself until you stop on a specific frequency.

Note:
The following frequencies cannot be programmed as band edges for the limited band scanning function:
Model A, D, E:
"4.000", "4.005", "7.990", "7.995"
Model B:
"4.000", "4.0125", "5.975", "5.9875"
Model C:
"4.000", "4.0125", "7.975", "7.9875"

I. Miscellaneous

1. To disable the keyboard and lock the FT-208R on the frequency you are currently using, slide the LOCK switch to the right. This will provide protection against accidental frequency changes. When the LOCK switch is moved to the right, the display will indicate "L". Locking the keyboard will not disable the two-tone (DTMF) generator during transmission.
2. To activate the memory backup in the CPU, place the BACKUP switch in the ON position. The built-in lithium battery will serve to backup the memory frequency, programmable shift frequency, etc., while the power switch is OFF, or while the transceiver is without battery power. The battery has an estimated lifetime of more than 5 years. After this period, please ask your Yaesu Dealer for a replacement.
3. The top panel HIGH-LOW switch may be set to either the HIGH (2.5 watt output) or LOW (300 mW output) position, allowing you to select different transmitter output powers. Use the LOW position whenever possible to prolong battery life.

J. Error Modes

1. If you inadvertently program a frequency incorrectly (e.g., by pushing "7353" and DIAL), the display will indicate "E" to tell you an error has been made. If this occurs, push C (Clear) to return to the previous frequency.
2. If you program a repeater shift outside the amateur band, such as –600 kHz shift at 144.500 MHz, the display will indicate "E" when the PTT switch is closed. No transmission will occur under this condition.

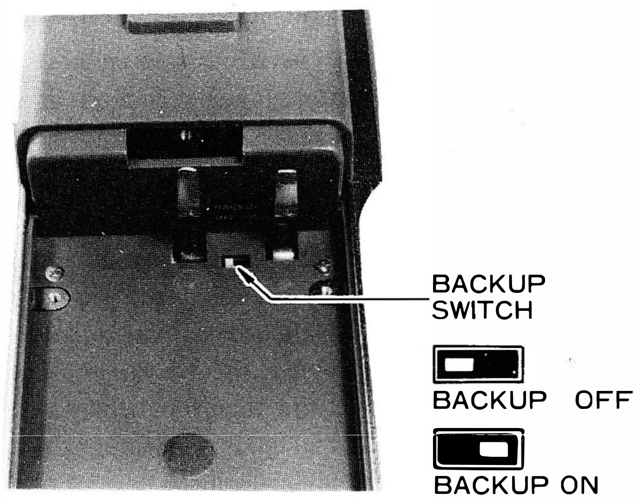
K. Tone Squelch Operation (Option)

1. When the optional FTS-32 tone squelch unit is installed, it may be activated by placing the SQL control in the TONE position (click-stop).
2. When a signal is received which contains a similar subaudible tone signal, the FT-208R squelch will open normally. If the incoming signal does not contain the subaudible tone squelch signal, the receiver will remain silent, but the BUSY indicator will become illuminated. This will alert the operator to the fact that the channel is in use.
3. On transmit, a subaudible tone will be superimposed on your voice signal, activating the receiver of other stations equipped with a similar tone squelch system. The tone frequency (both transmit and receive) can be selected by the DIP switch mounted on the FTS-32. Refer to the frequency chart supplied with the optional FTS-32 to determine the setting for the tone frequency you require.
4. For autopatch or control purposes, the two-tone (DTMF) encoder can be activated from the keyboard by pushing the PTT switch and dialing the required access codes and telephone number.

For installation information regarding the FTS-32 Tone Squelch and FTS-32AE Tone Encoder, please refer to the instructions supplied with the respective units.

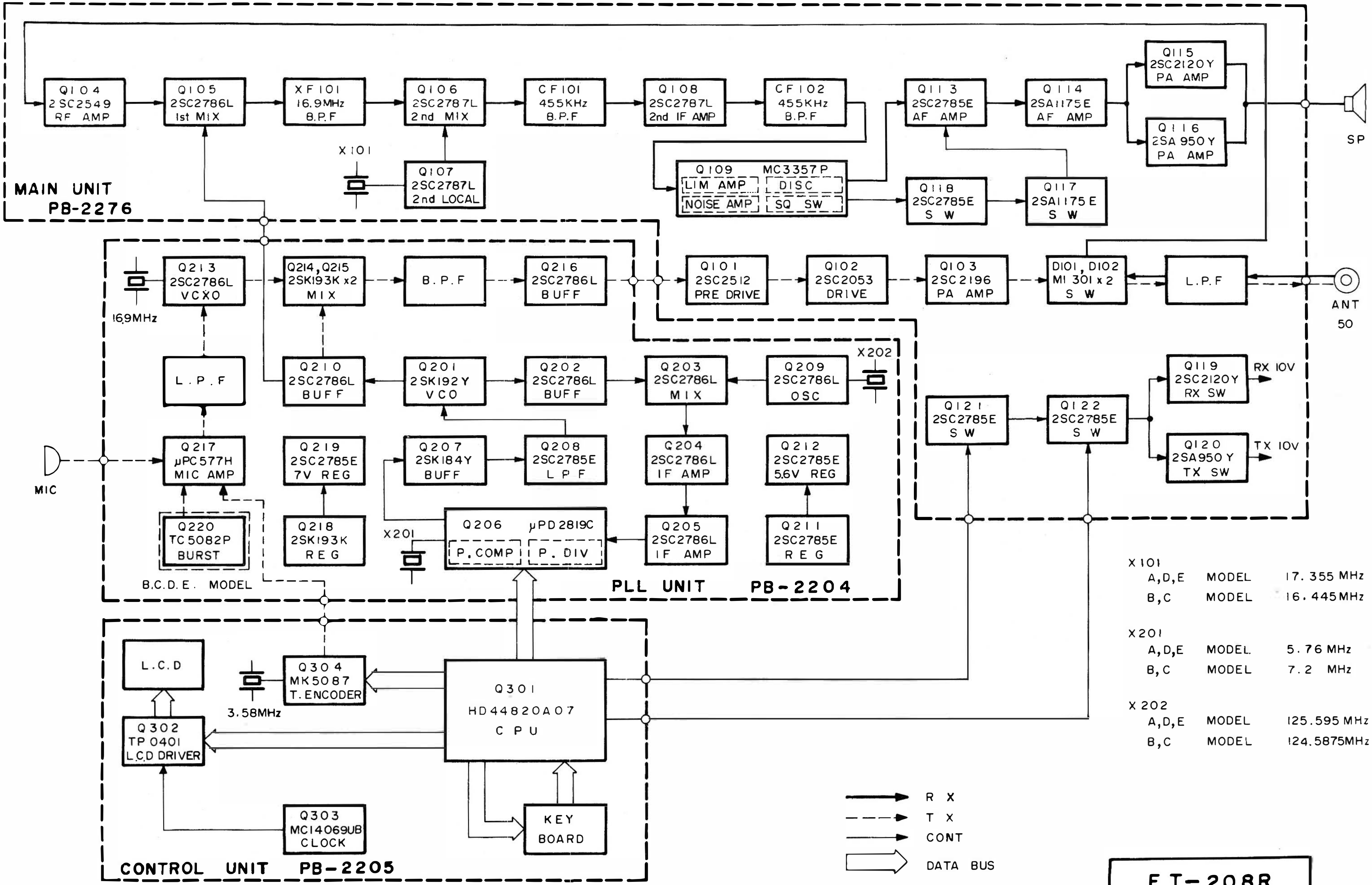
Memory Backup Information

The FT-208R. memory channels are protected by a memory backup lithium cell in the transceiver. When the transceiver is delivered from our factory, the memory backup switch is in the OFF position in order to clear the information in the memory. To activate the memory backup, turn the memory backup switch in the battery compartment to the ON position. Once this switch is turned on, it is not necessary to turn it off because of the extremely low current consumption of approximately 0.1 μA. The estimated life of the cell is more than five years. If, after this period, the memory backup becomes intermittent, ask your Yaesu dealer for a replacement cell. The life of the lithium battery is not extended significantly by keeping the backup switch OFF.



SECTION 2—TECHNICAL NOTES

BLOCK DIAGRAM



FT-208R

BLOCK DIAGRAM

CIRCUIT DESCRIPTION

The block diagram and circuit description to follow will provide the owner with a better understanding of the FT-208R transceiver. Please refer to the schematic diagram for details.

RECEIVER

The VHF signal from the antenna is fed through a lowpass filter and antenna diode switch to RF amplifier Q_{104} **(2SC2549)**, which is protected by a three-stage bandpass filter to minimize intermodulation caused by strong out-of-band signals. The amplified signal from Q_{104} is fed to the first mixer, Q_{105} **(2SC2786L)**, where the RF signal is mixed with the first IF signal delivered from the PLL unit, producing a 16.9 MHz first IF. The IF signal is passed through a monolithic crystal filter, XF_{101}, which has a 3 dB bandwidth of ±14 kHz, and is fed to the second mixer, Q_{106} **(2SC2787L)**. Here the first IF signal is heterodyned with the second local oscillator signal, 17.355 MHz (Model A, D, E) or 16.445 MHz (Model B, C), delivered from Q_{107} **(2SC2787L)**, resulting in a second IF of 455 kHz. The IF signal is passed through a ceramic filter, CF_{101}, amplified by Q_{108} **(2SC-2787L)**, then fed through another ceramic filter, CF_{102}. The highly filtered IF signal is then fed to Q_{109} **(MC3357)**, which functions as an IF amplifier, limiter, discriminator, and squelch control. The amplification and limiting process eliminates amplitude variations in the IF signal, which is then fed to the discriminator section of Q_{109}, where an audio response is produced in accordance with a corresponding frequency shift in the IF signal. The audio signal is then amplified by Q_{113} **(2SC2785E)**, Q_{114} **(2SA1175E)**, Q_{115} **(2SC2120Y)**, and Q_{116} **(2SA950Y)**. The audio PA section delivers 500 mW of audio output power to the speaker.

When no carrier is present in the 455 kHz IF, the high frequency noise at the output of the discriminator is amplified by the noise amplifier section of Q_{109}. This amplified signal drives a squelch switch in the same IC, which in turn biases Q_{118} **(2SC2785E)** and Q_{117} **(2SA1175E)** such that DC voltage is removed from AF amplifier Q_{114}, thus silencing the receiver.

When a carrier is present in the 455 kHz IF, the noise is removed from the discriminator output, and Q_{114} is then biased for normal operation, thus allowing receiver recovery. VR_{102} sets the squelch sensitivity level. Scanning control voltages are also provided by Q_{109}, allowing interactive operation with the Central Processing Unit for control of the SCAN STOP function.

TRANSMITTER

The transmitter produces a frequency modulated signal. The audio input from the microphone or DTMF encoder Q_{304} **(MK5087)** is amplified by Q_{217} **(μPC577H)**, which also limits the maximum amplitude of the audio input and filters out signal components above the normal speech range. The audio signal is then applied to varactor diode D_{209} **(FC53)**, which varies the frequency of a 16.9 MHz crystal oscillator, Q_{213} **(2SC2786L)**. This signal is then delivered to the balanced mixer and amplifier stages.

A portion of the output from VCO (Voltage Controlled Oscillator) Q_{201} **(2SK192Y)** is fed through buffer amplifier Q_{202} **(2SC2786L)** to PLL (Phase Locked Loop) mixer Q_{203} **(2SC2786L)**, which is also supplied with a PLL local signal of 125.595 MHz (Model A, D, E) or 124.5875 MHz (Model B, C) delivered from Q_{209} **(2SC2786L)**. This results in a 1.505–5.500 MHz (Model A, D, E) or 2.5125 MHz–4.500 MHz (Model B), 2.5125 MHz–6.500 MHz (Model C) PLL IF signal. See page 2-4 for Frequency Relationships.

The PLL IF signal is amplified by Q_{204} and Q_{205} **(2SC2786L)** and then fed to Q_{206} **(μPD2819C)**. This programmable divider divides the signal by a factor of 301–1100 (Model A, D, E), 201–360 (Model B), 201–520 (Model C), producing basic 5 kHz (Model A, D, E), 12.5 kHz (Model B, C) steps for the synthesizer. One section of Q_{206} acts as a 5.76 MHz (Model A, D, E) or 7.2 MHz (Model B, C) oscillator, which, in turn, is divided into 5 kHz (12.5 kHz) steps. The phase comparator section of Q_{206} then compares the phase of the PLL IF signal with that of the PLL reference signal, and any difference in phase produces an error-correcting voltage, which is used to control varactor diodes to lock the PLL onto the correct frequency. This feedback system produces a highly stable output signal.

The IF signal is fed to a balanced mixer, Q_{214}/Q_{215} **(2SK193K)**, where the 16.9 MHz FM signal is mixed with a local signal from the VCO, with the output being at the ultimate transmitting frequency. A three-stage auto-tune resonator between Q_{214}/Q_{215} and Q_{216}, along with a filter immediately following Q_{216} **(2SC2786L)**, provide superior rejection of spurious signals.

The signal is delivered to a three-stage RF power amplifier consisting of Q_{101} **(2SC2512)**, Q_{102} **(2SC2053)**, and Q_{103} **(2SC2196)**, resulting in a power output of 2.5 watts.

HETERODYNE OSCILLATOR

The heterodyne signal of 127.100–131.095 MHz (Model A, D, E), 127.100–129.0875 MHz (Model B), 127.100–131.0875 MHz (Model C) for the receiver and transmitter is generated by the PLL circuit just described.

The VCO, Q_{201} **(2SK192Y)**, generates a signal at one of the above frequencies. The oscillator frequency is controlled by varactor diode D_{201} **(1T25)**, which varies the capacitance of the oscillator tuned circuit in accordance with a control voltage. This control voltage is generated by phase comparator Q_{206}, as mentioned earlier, **(μPD2819C)** and delivered through a lowpass filter consisting of Q_{207} **(2SK184Y)** and Q_{208} **(2SC-2785E)**, to the VCO.

This voltage is then fed to varactor diode D_{201}, which changes the output phase of the VCO to lock with that of the reference signal. The control voltage is also used to tune the transmitter bandpass filters and local signal amplifier filter, thus providing optimum spurious attenuation.

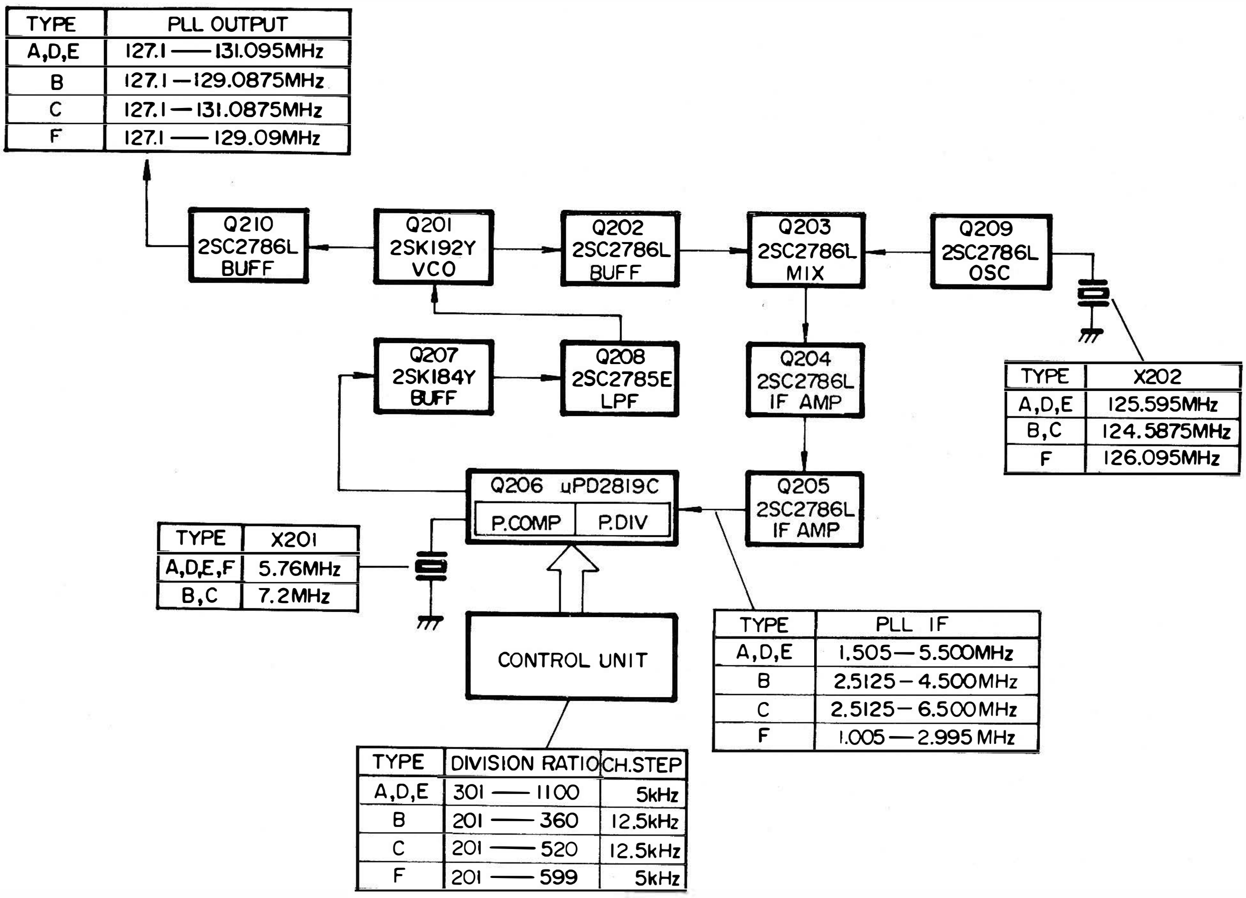
PLL CONTROL SECTION

The PLL Control Unit employs a 4-bit microprocessor chip, Q_{301} **(HD44820A07)**, which provides various control information for display control, transmit disable, DTMF encoder, etc. The reader is referred to the block diagram of the PLL control Unit for an explanation of the functions of the CPU. A full description of each logic state is beyond the scope of this manual.

CRYSTAL DATA

Function	Type of Holder	Frequency (MHz)	Mode	Capacitance (pF)	Equivalent Resistance (Ω)	Drive Level (mW)	Yaesu Part Number	Remarks (Model)
X101 2nd Local	HC-18/T	16.445	Fundamental	Load C: 27pF Co < 6pF	< 15	2	H0102406	(B, C)
	HC-18/T	17.355					H0102419	(A, D, E, F)
X201 PLL Ref	HC-18/T	5.76	Fundamental	Load C: 24pF Co < 6pF	< 40	2	H0102408	(A, D, E, F)
	HC-18/T	7.20			< 30		H0102409	(B, C)
X202 PLL Local	HC-18/T	125.595 (41.865)	3rd overtone	Load C: 20pF −300Hz Co < 6pF	< 20	2	H0102403	(A, D, E)
	HC-18/T	124.5875 (41.5292)					H0102405	(B, C)
	HC-18/T	126.095 (42.0317)		Load C: 20pF −200Hz Co < 6pF			H0102404	(F)
X203 Carrier	HC-18/T3P	16.900	Fundamental	6.6±0.3pF	< 20	2	H0102407	Determined by circuit VCXO/MOD TS-683/TSM Parallel resonance 30pF
X204 Tone Burst	HC-18/T	7.168	Fundamental	Co < 6pF Load C: 24pF	< 30	2	H0101982	Tone Frequency 1750Hz (B, C, D, E)
	HC-18/T	7.3728					H0101983	Tone Frequency 1800Hz (E)

PLL CIRCUIT FREQUENCY RELATIONSHIPS



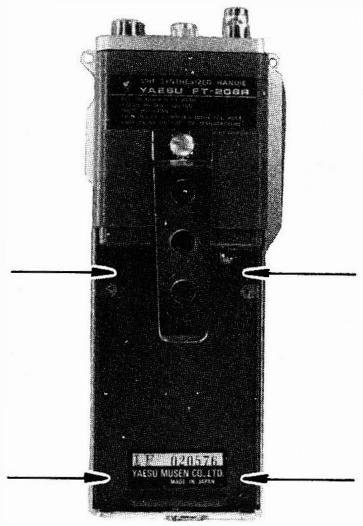
SECTION 3—SERVICING

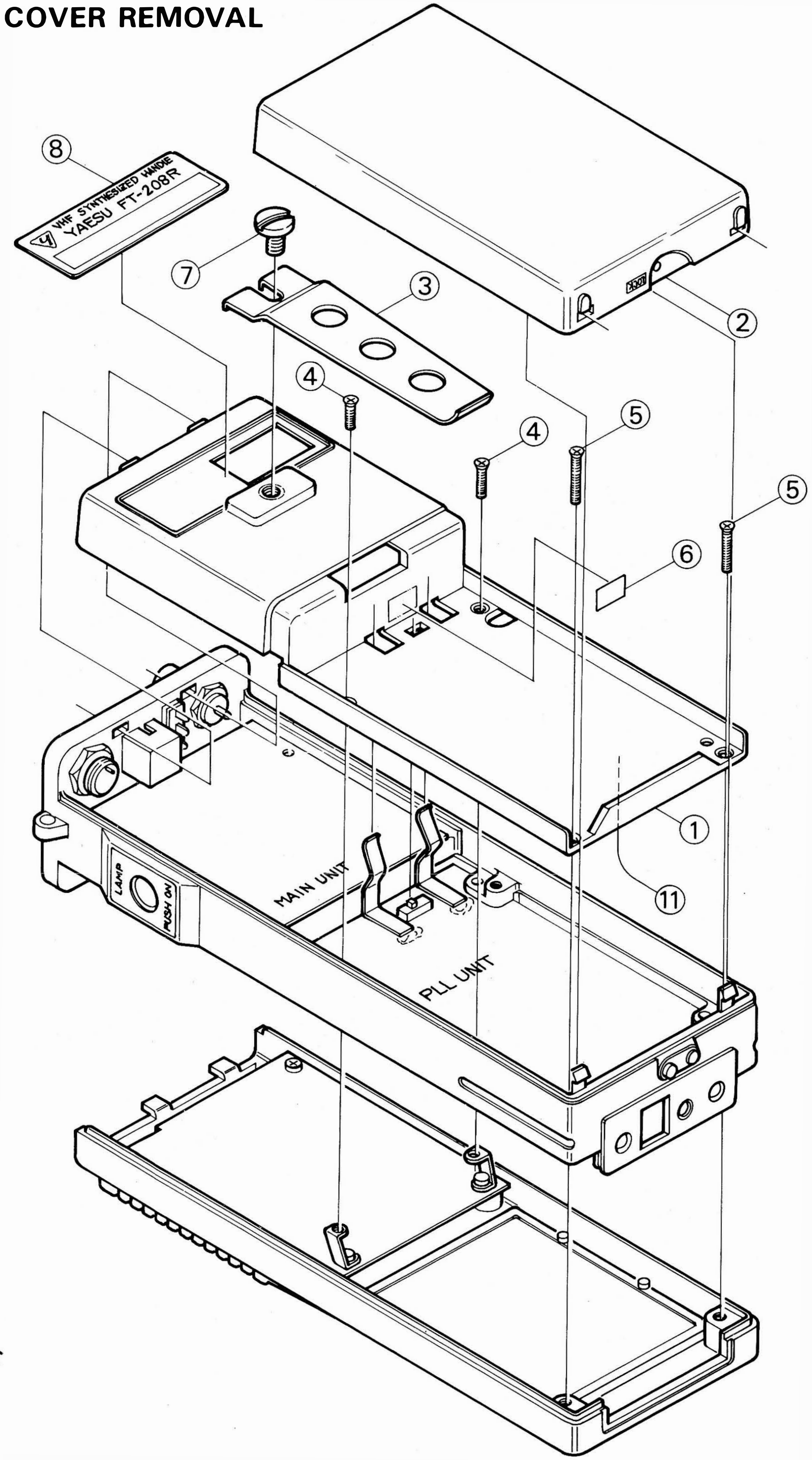
OUTER COVER REMOVAL

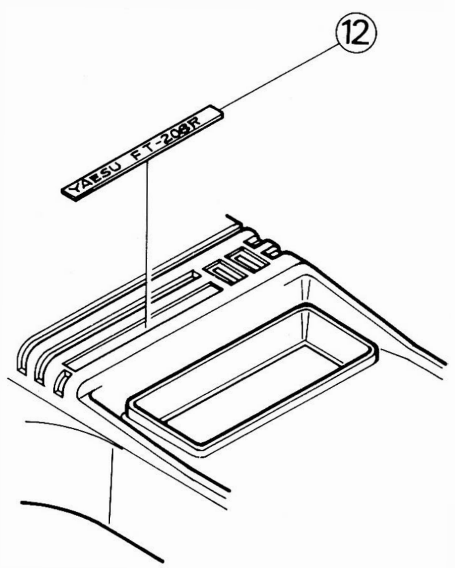
REMOVAL OF THE TRANSCEIVER CASE

1. Remove the battery case cover and the Ni-Cd battery pack from the transceiver as you would usually do when replacing the battery pack.

2. Remove the four screws affixing the rear case in the battery compartment and carefully remove the rear case and front panel.



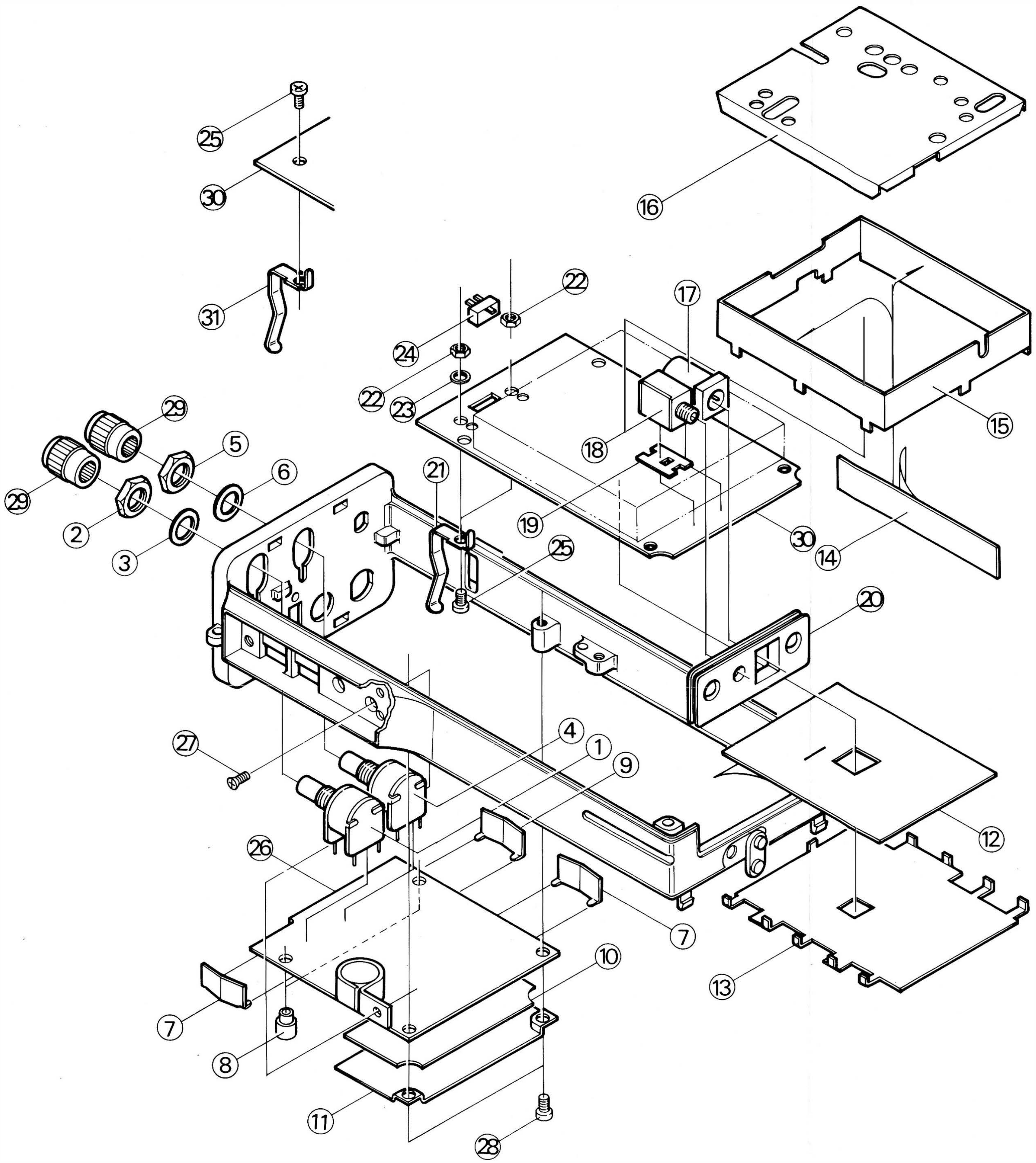




REPLACEABLE MECHANICAL PARTS

Item No.	Nomenclature	YAESU Part No.	Qty
1	Rear Cover	R3066720B	1
2	Battery Cover	R3066730B	1
3	Belt Clip	R0066810A	1
4	Flat Head Screw (M2x10)	U30110001	2
5	Flat Head Screw (M2x16)	U30116001	2
6	B.U. Switch Label	R8069820	1
7	Clip Screw	R6066820A	1
8	Logo Plate B (FT-208 . . . Model F)	R8069930	1
	Logo Plate C (FT-208R . . . Model A–E)	R8069890	
9	Pan Head Screw	U02104001	2
10	Not Used		
11	PLL Shield Plate A	R0069510A	1
	Insulator	R7069530A	1
12	Model Plate A (FT-208)	R8066980	1
	Model Plate D (FT-208R)	R8069880	

EXPLODED VIEW(1)

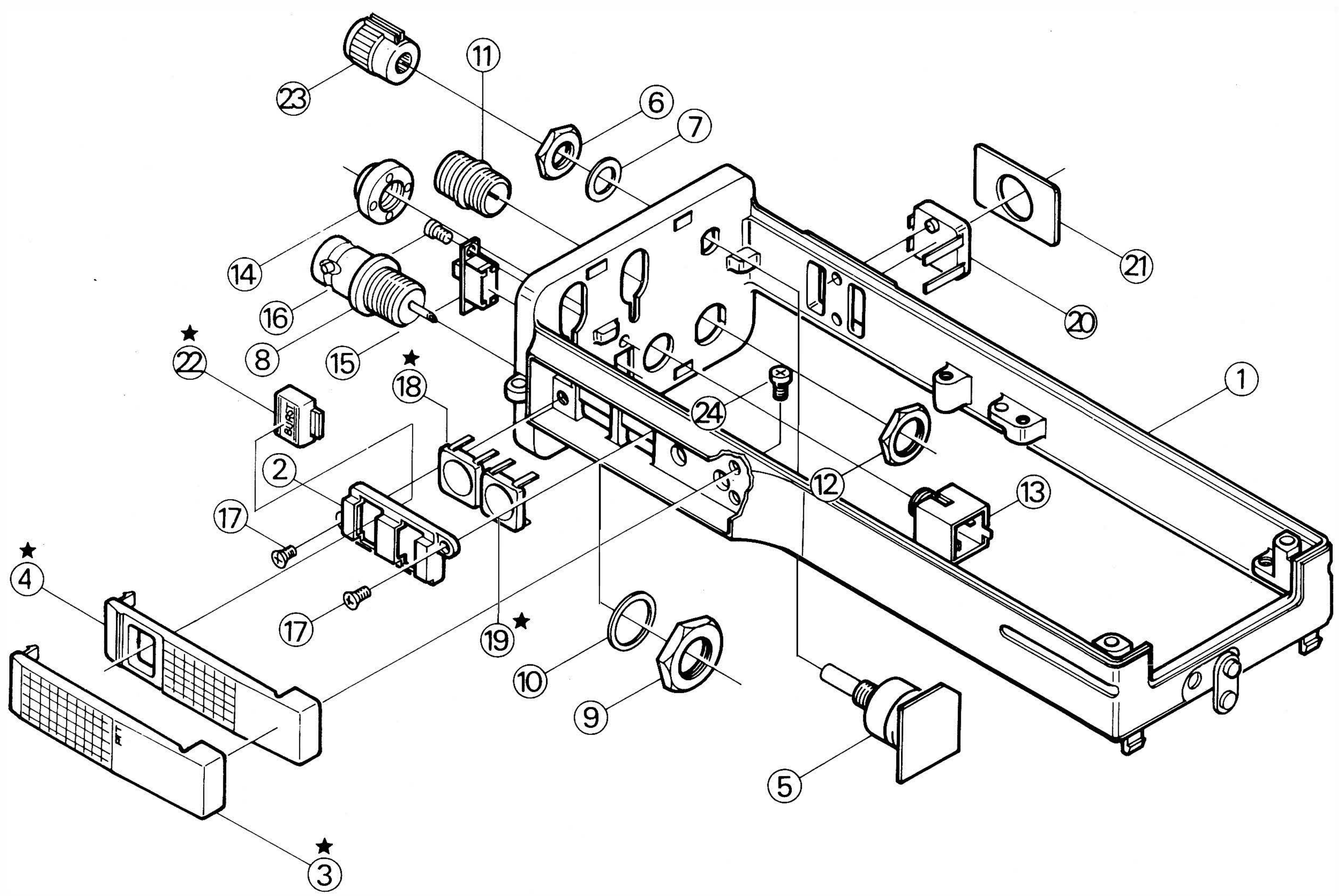


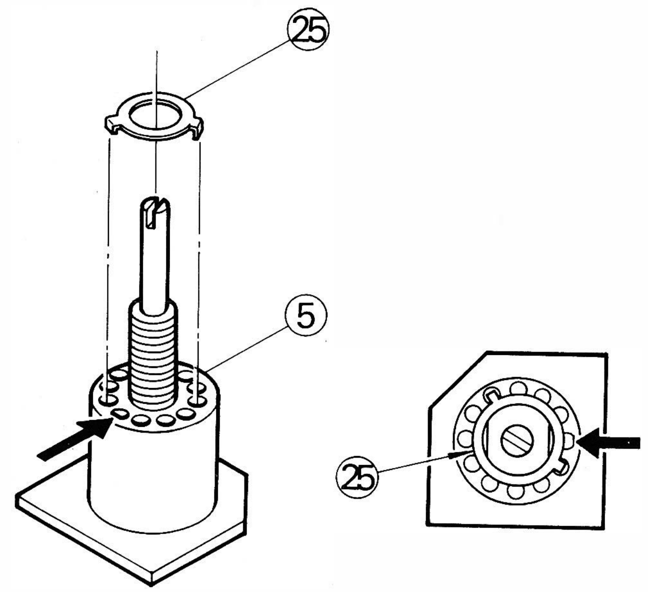
REPLACEABLE MECHANICAL PARTS

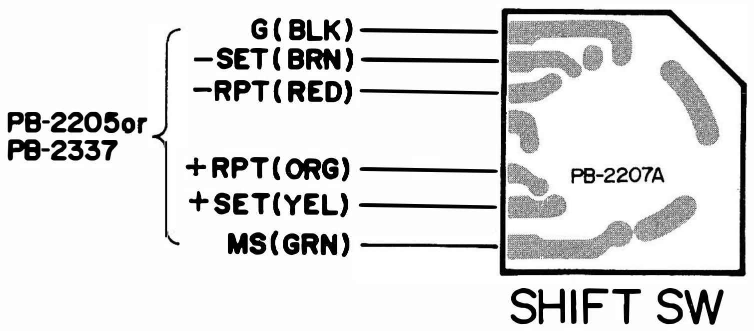
Item No.	Nomenclature	YAESU Part No.	Qty	
1	VOL Potentiometer	J60800075	1	
2	Nut	Supplied w/AF Pot.	1	
3	Flat Washer	" " "	1	
4	SQL Potentiometer	J60800076	1	
5	Nut	Supplied w/SQ. Pot.	1	
6	Flat Washer	" " "	1	
7	Grounding Spring A	R0071020	2	Note 1
8	Stud	R6066960	2	Note 2
9	Grounding Spring	R0065870	1	Note 2
10	Insulating Pad A	R7069060	1	
11	Shield Plate A	R0068440	1	
12	PLL Insulator A	R7070290B	1	Note 2
13	PLL Shield Plate	R0066910B	1	Note 2
14	PLL Shield A Pad	R7069730	2	
15	PLL Shield Case	R0066890A	1	
16	PLL Shield Cover	R0066900B	1	
17	Coaxial Jack	P0090187	1	
18	Mini 2 Conductor Jack	P1090127	1	
19	CH. Jack Cover	R7066940	1	
20	Bottom Panel A	R3068330	1	
21	Contact Clip	R0066790C	2	Note 3
22	Nut	U60100001	2	Note 3
23	Washer	U75001000	1	Note 3
24	Backup Switch	N6090026A	1	
25	Pan Head Screw	U00104001	2	
26	Main Unit	C0022030	1	
27	Flat Head Screw	U30204001	1	
28	Pan Head Screw	U02104001	2	
29	Knob FT-10S	R3066870	2	
30	PLL Unit	C0022040	1	
31	Contact Clip	R0066790C	2	Note 4

NOTE 1 Use only one spring.
NOTE 2 Do not use for FT-208R.
NOTE 3 FT-208R; Ser. No. 010001 to 029999.
NOTE 4 FT-208R; Ser. No. up to 030001.

EXPLODED VIEW(2)







REPLACEABLE MECHANICAL PARTS

Item No.	Nomenclature	YAESU Part No.	Qty	
1	Main Frame	R4066700A	1	
2	Switch Holder; PTT	R3066750	1	
3	Switch Lever A; PTT	R3067050	1	Note 1
4	Switch Lever B; PTT	R3067060A	2	Note 2
5	Rotary Switch; Shift	N0190080A	1	Note 3
6	Nut	Supplied w/Switch	1	
7	Lock Washer	" "	1	
8	BNC Jack	P1090191	1	
9	Nut	Supplied w/BNC Jack	1	
10	Flat Washer	" " "	1	
11	6P Jack; MIC	P1090052	1	
12	Nut	Supplied w/MIC Jack	1	
13	Earphone Jack	P1090197	1	
14	Nut Special; EAR Jack	R6068230	1	
15	Slide Switch; HI/Low	N6090025	1	
16	Pan Head Screw M2x3	U00103001	1	
17	Flat Head Screw "	U00103001	2	
18	Push Switch; Burst	N4090040	1	Note 4
19	Push Switch; PTT	N4090040	1	Note 5
20	Push Switch; Lamp	N4090041	1	Note 6
21	Switch Plate; Light	R8066880A	1	
22	Switch Top; Burst	R3067070	1	Note 7
23	Knob FT-10N; Shift	R3066860	1	
24	Pan Head Screw	U02106001	1	
25	Stop Ring		1	

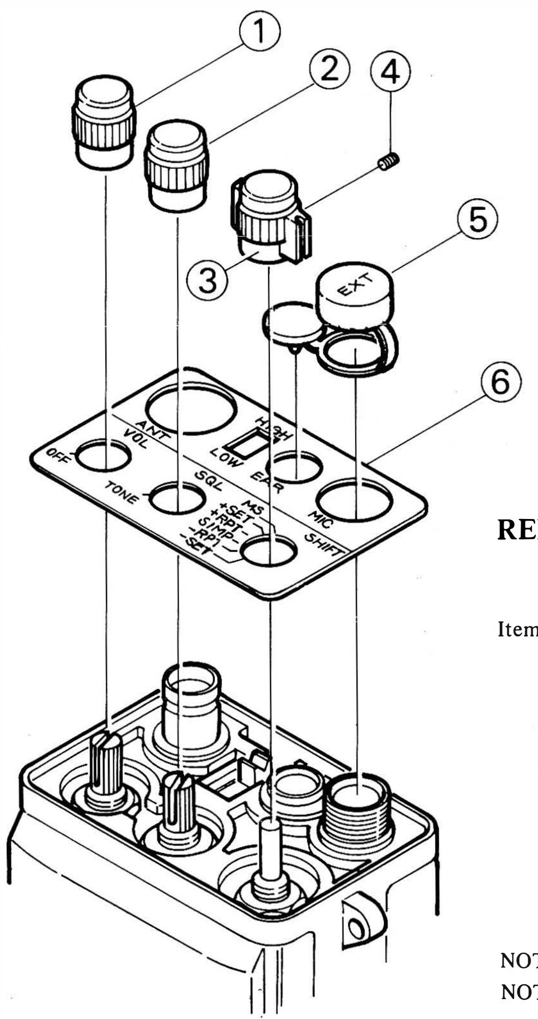
NOTE 1 FT-208R; Model A, F
NOTE 2 FT-208R; Model B, C, D, E
NOTE 3 w/Switching board.
NOTE 4 FT-208R; Model A, F are PTT only.
Other model is burst switch.
NOTE 5 FT-208R. Do not used Model A, F.
Other model is PTT switch.
NOTE 6 Mount lamp switch applying adhesive inside frame.
NOTE 7 FT-208R. Do not used Model A, F.

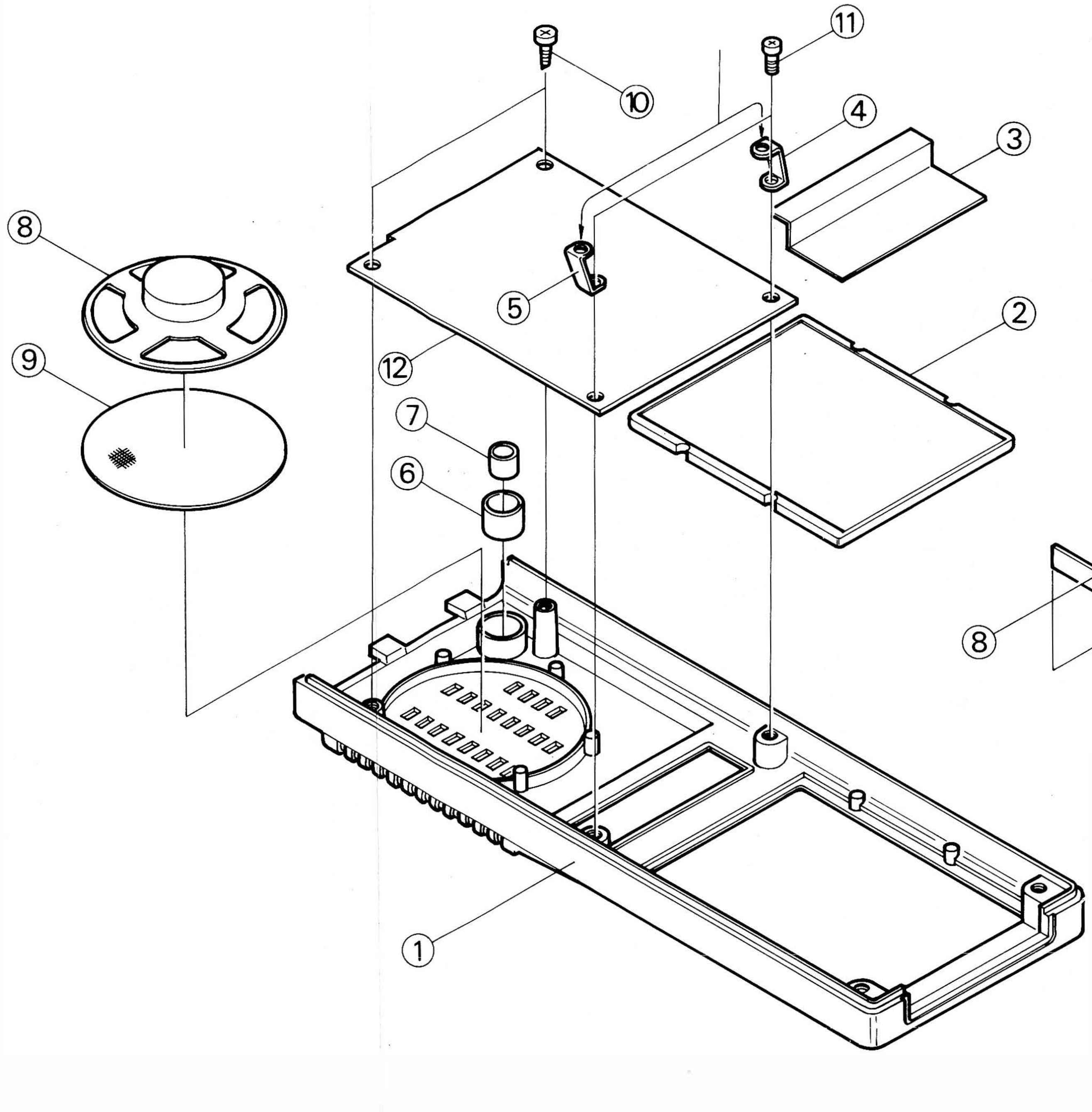
EXPLODED VIEW (3)

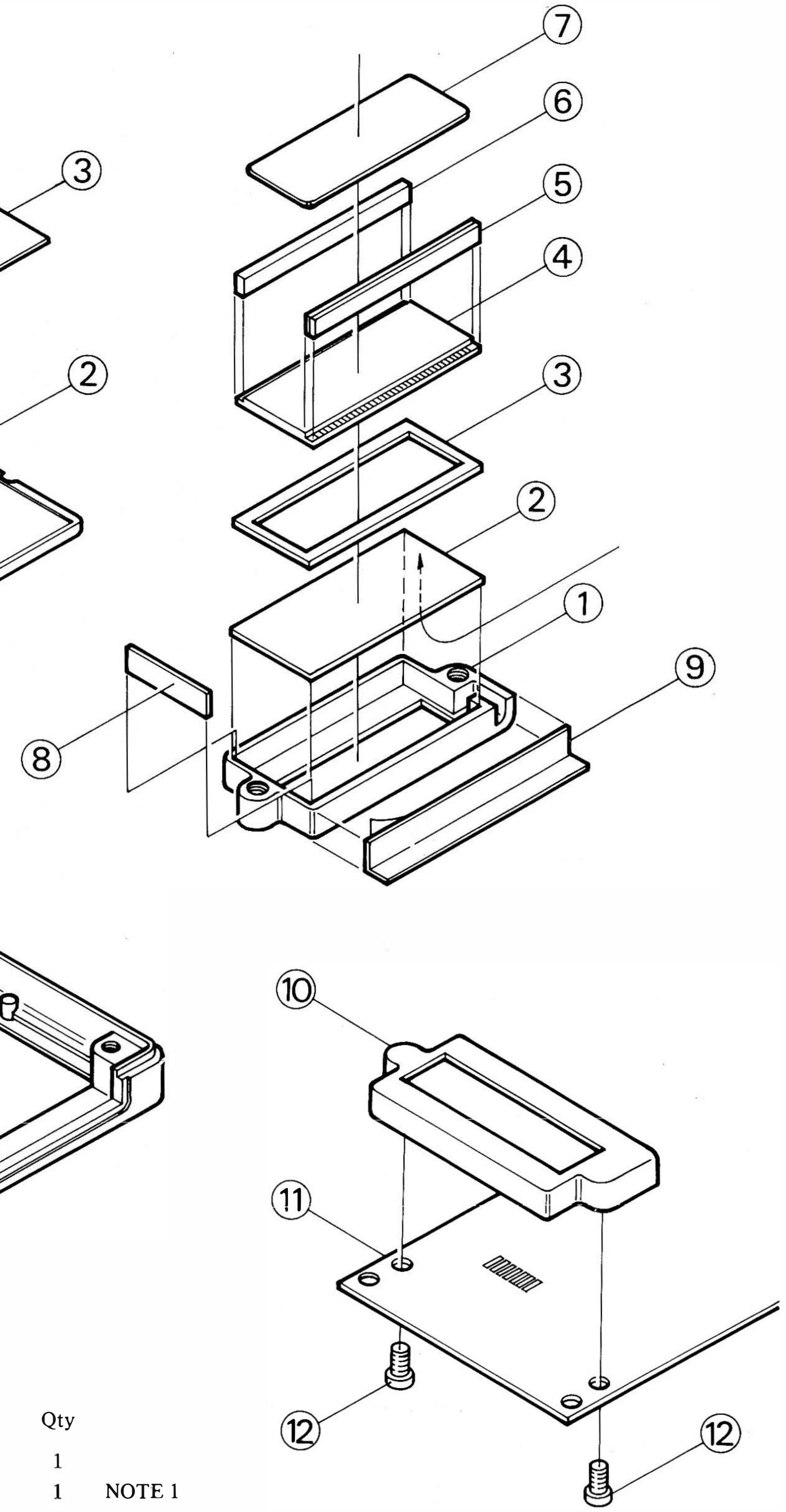
REPLACEABLE MECHANICAL PARTS

Item No.	Nomenclature	YAESU Part No.	Qty	
1	Front Panel	R3066710	1	
2	Keyboard Unit	N5090006	1	
3	Light Shield	R7069720	1	Note 1
4	Chassis Bracket A	R0069710	1	
5	Chassis Bracket B	R0069711	1	
6	Microphone Collar	R7046630	1	
7	Microphone Element	M3290001	1	
8	Speaker Element	M4090050	1	
9	Speaker Net	R7049011	1	
10	Pan Head Tapping Screw (2φx6)		2	
11	Pan Head Screw (M2x4)		2	
12	Control Unit	C0022050A or C0023370	1	

NOTE 1 Only used in early model







REPLACEABLE MECHANICAL PARTS

Item No.	Nomenclature	YAESU Part No.	Q'ty	
1	Knob FT-10S; VOL	R3066870	1	
2	Knob FT-10S; SQL	R3066870	1	
3	Knob FT-10N; Shift	R3066860	1	
4	Set Screw	Supplied w/FT-10N	1	
5	Cap A MIC/EAR	R3066950A	1	
6	Top Panel A	R8071040	1	Note 1
	Top Panel B	R8071030	1	Note 2

NOTE 1 FT-208R, Model F
NOTE 2 FT-208R, Model A, B, C, D, E

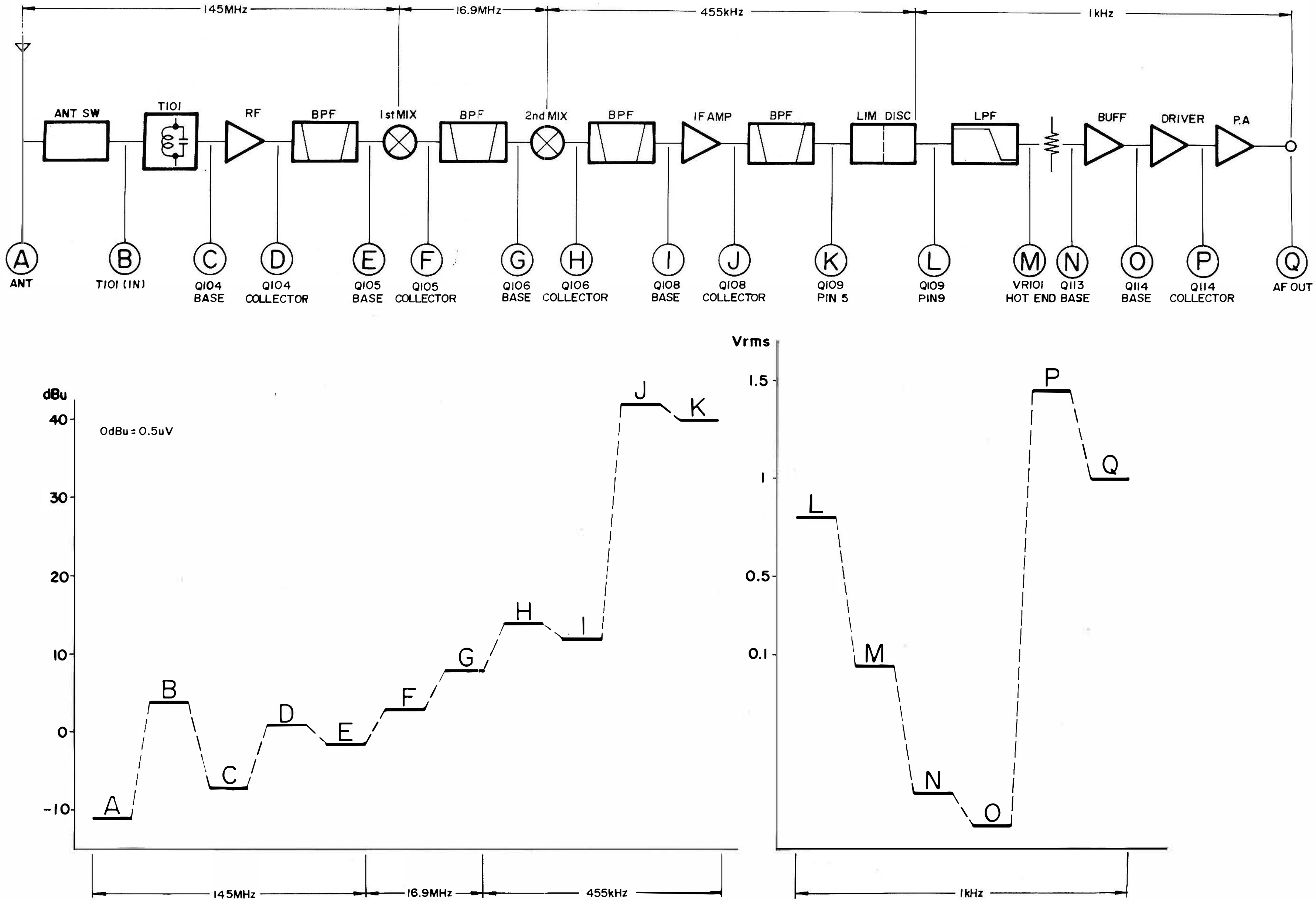
REPLACEABLE MECHANICAL PARTS

Item No.	Nomenclature	YAESU Part No.	Qty	
1	LCD Frame	R3066740	1	
2	LCD Filter	R7066770A	1	NOTE 1
3	LCD Mat	R7066780A	1	
4	LCD Unit	G6090021	1	
5	Contact Strip	S2000014	1	
6	Spacer	S2000015	1	
7	Diffusor	S6000043	1	
8	LCD Shim	R7071920	1	
9	Light Shield	R7069720	1	
10	LCD Assembly		1	
11	Control Unit	Refer to Parts List	1	
12	Pan Head Screw	U01104001	2	

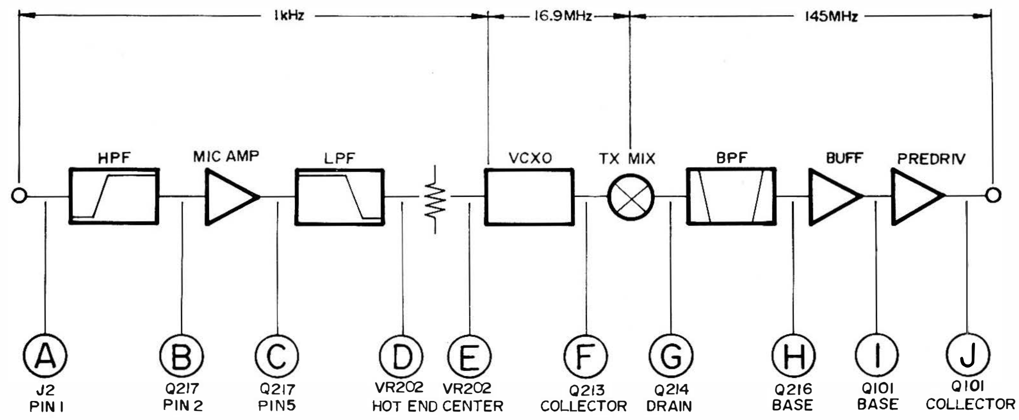
NOTE 1. Top side should be smoked side.

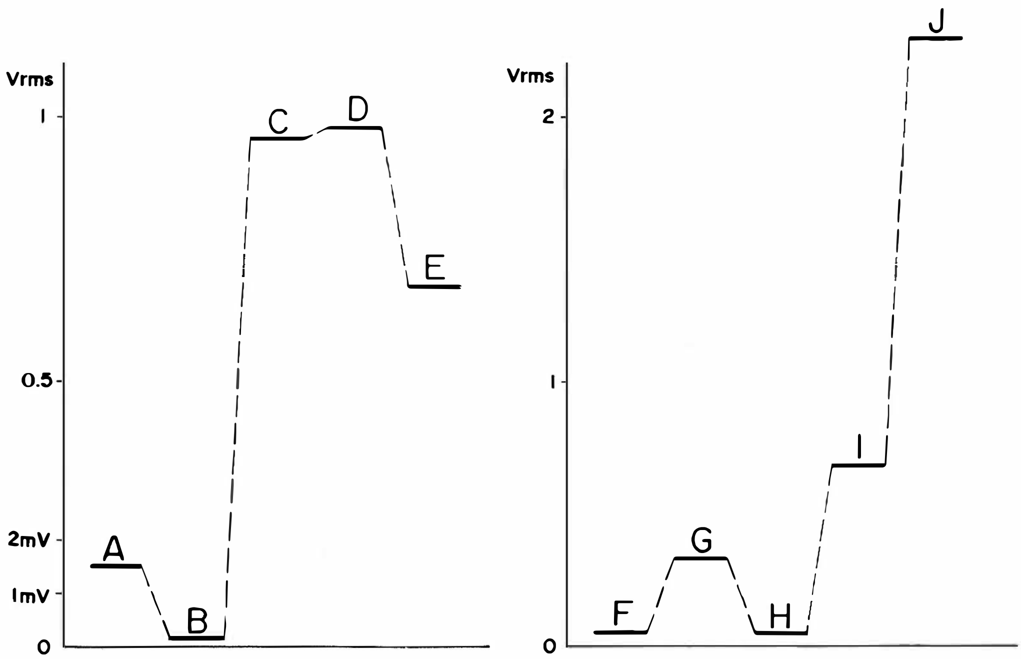
NOTE:
1. Before assembling the LCD carefully clean the front glass.
2. Clean the gold contacts with a soft cloth and pure water or alcohol.
3. Do not allow your skin to come in contact with the contact surface.
4. Before tightening the two mounting screws (12) position the LCD assembly and the flexible rubber contact strip so that all segments of the display are active (using 8's).

FT-208R LEVEL DIAGRAM (RECEIVER SECTION)

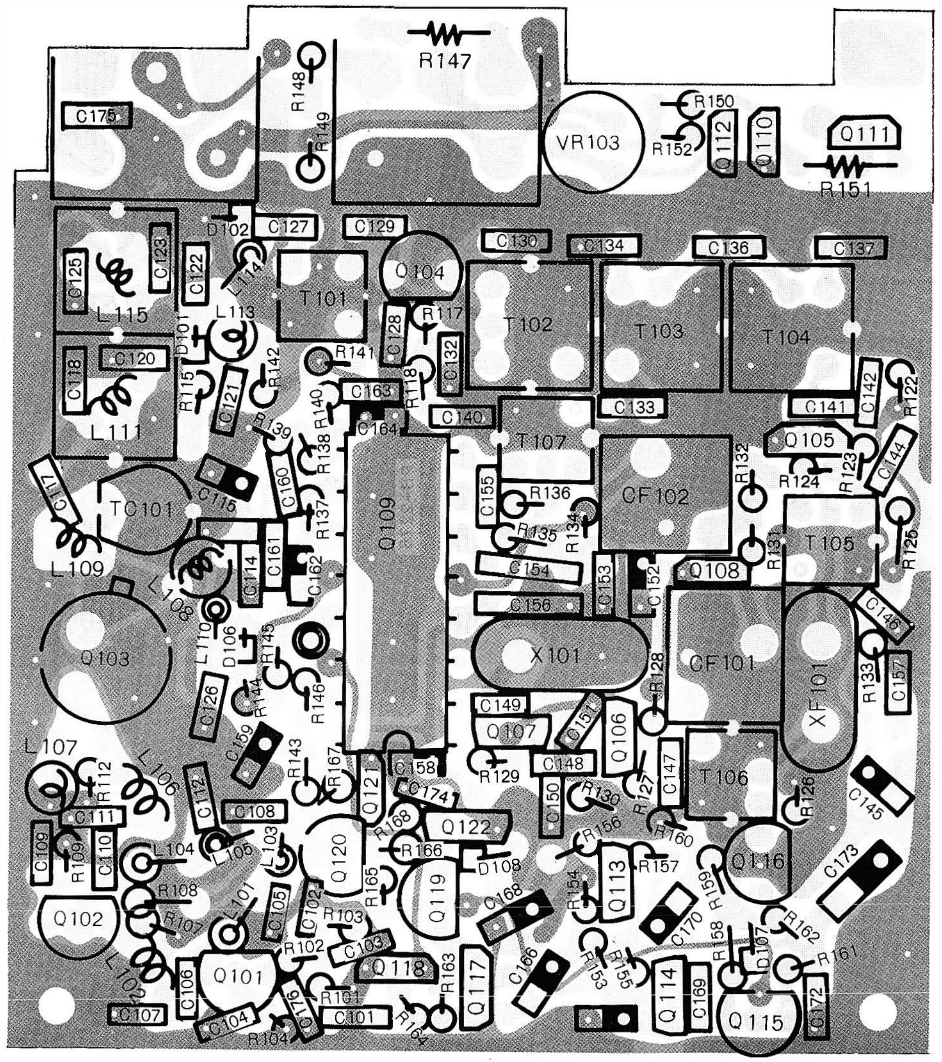


FT-208R LEVEL DIAGRAM (TRANSMITTER SECTION)

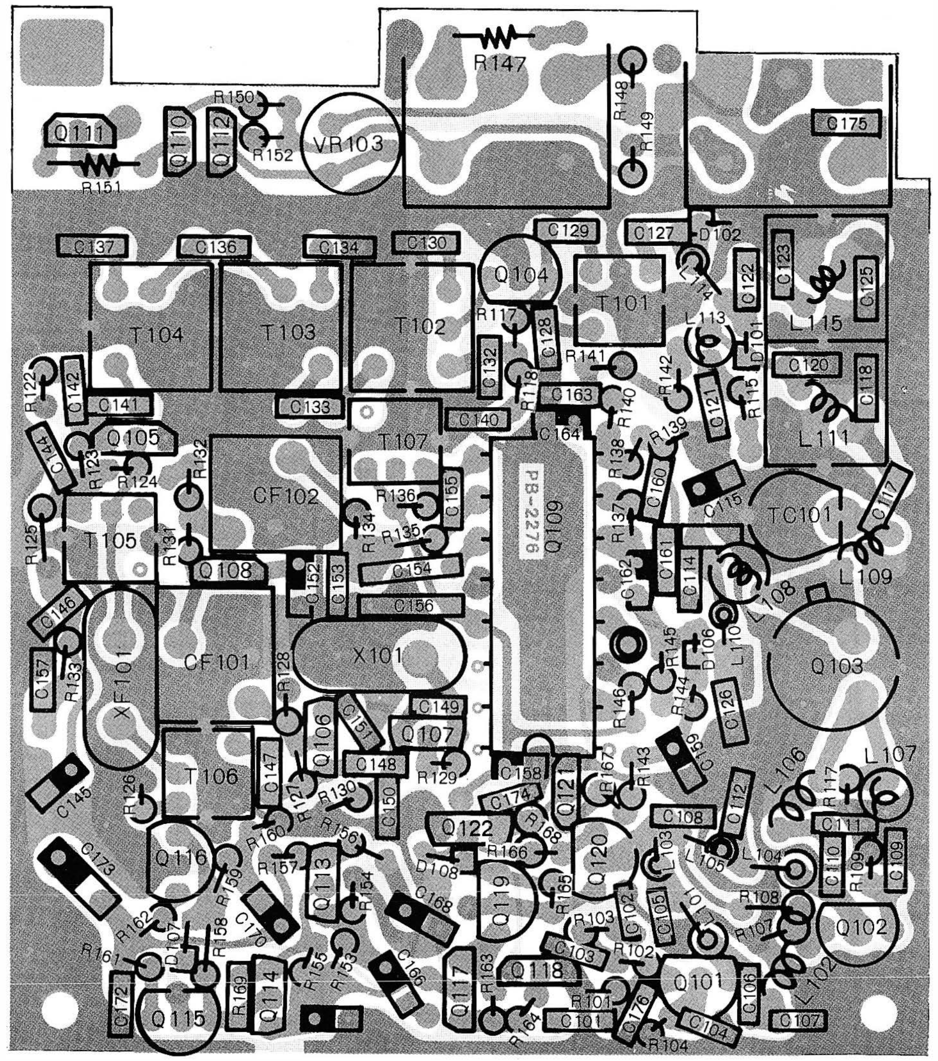




MAIN UNIT PARTS LAYOUT



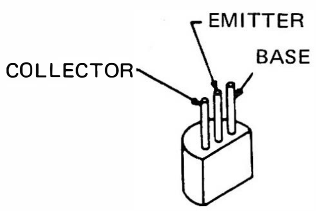
Viewed from component side



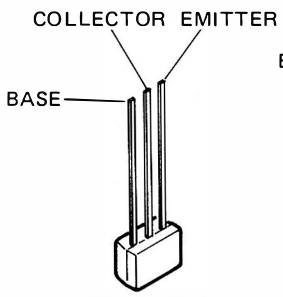
Viewed from solder side

MAIN UNIT VOLTAGE CHART (DC VOLTS)

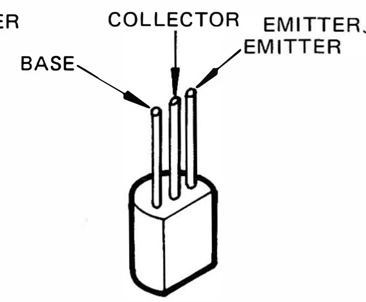
PIN	B	C	E	MODE
Q101	0.9	10.6	0.6	TX
Q102	1.2	10.6	0.7	TX
Q103	*	10.8/3.3	0	TX H/L
Q104	0.8	5.5	0	RX
Q105	0.7	6.8	0	RX
Q106	2.3	3.7	1.6	RX
Q107	1.5	1.6	0.9	RX
Q108	6.4	7.8	5.7	RX
Q110	0.6/0	0.05/10.3	0	RX TONE SQ/SQ TIGHT
Q111	10.1/10.3	10.8/0	10.8	RX TONE SQ/SQ TIGHT
Q112	0.6/0	0.02/0.06	0	RX TONE SQ/SQ TIGHT
Q113	6.9/0.05	9.0/0.03	6.3/0.1	RX SQ OPEN/CLOSE
Q114	9.0/0.03	5.4/0	9.7/0.03	RX SQ OPEN/CLOSE
Q115	5.4/0	10.8	4.8/0.15	RX SQ OPEN/CLOSE
Q116	4.0/0	0	4.7/0.15	RX SQ OPEN/CLOSE
Q117	9.1/10.0	9.7/0.03	9.9/10.1	RX SQ OPEN/CLOSE
Q118	0.6/0.01	0.02/10.0	0	RX SQ OPEN/CLOSE
Q119	10.6/0.8	10.8	9.9/0.5	RX/TX
Q120	10.3/10.0	0.01/10.7	10.8/10.7	RX/TX
Q121	0.6/0	0.01/0.7	0	RX/TX
Q122	0.01/0.7	10.3/0.05	0	RX/TX



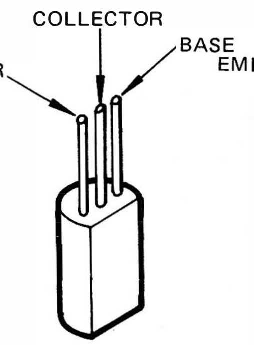
2SC2512
2SC2549



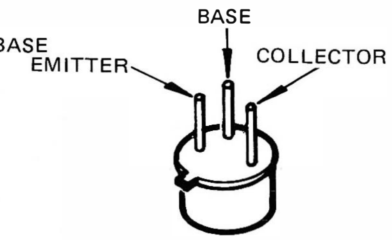
2SA1175E
2SC2785E
2SC2786L
2SC2787L



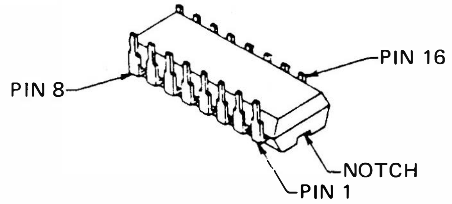
2SA950Y
2SC2120Y



2SC2053



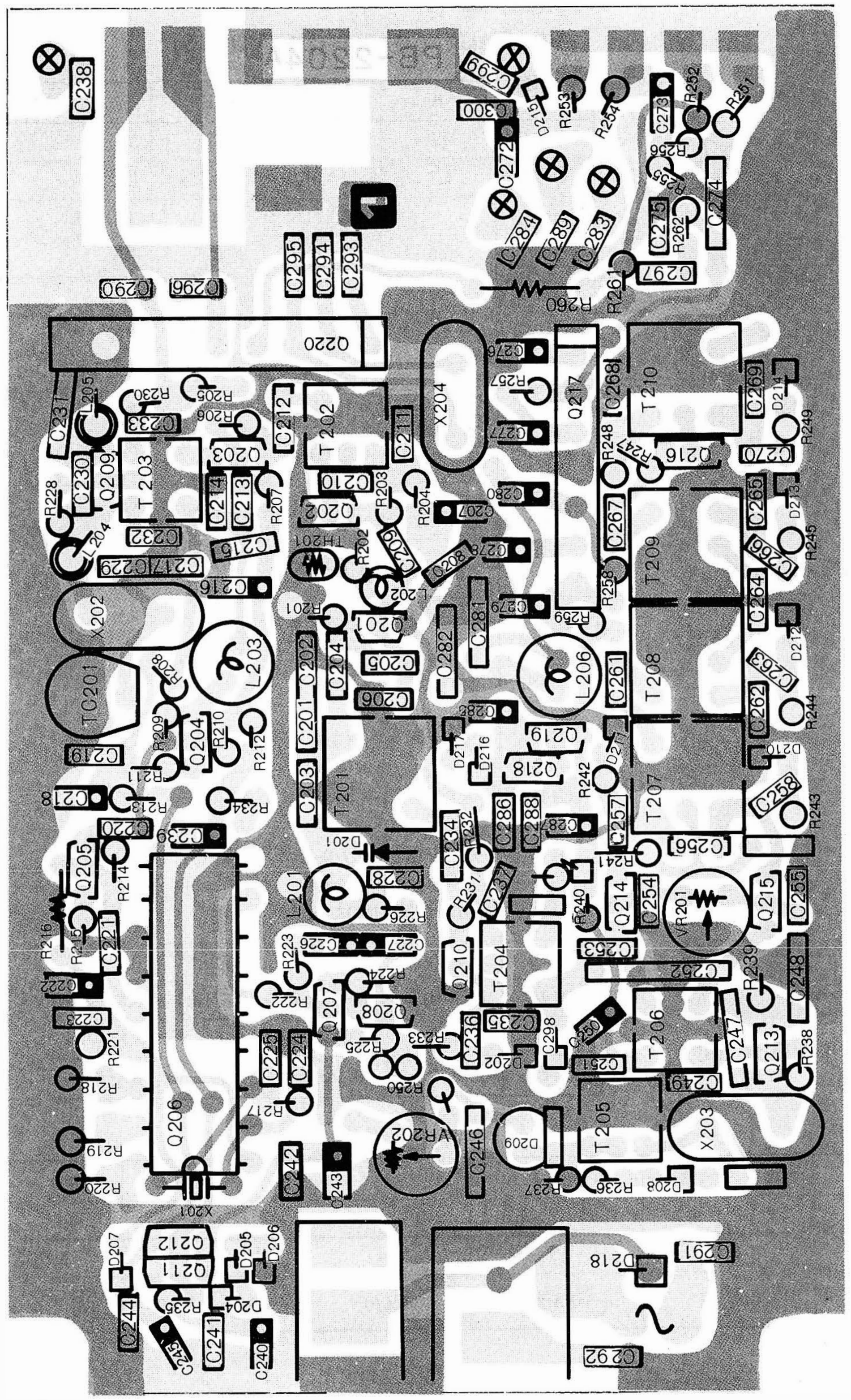
2SC2196



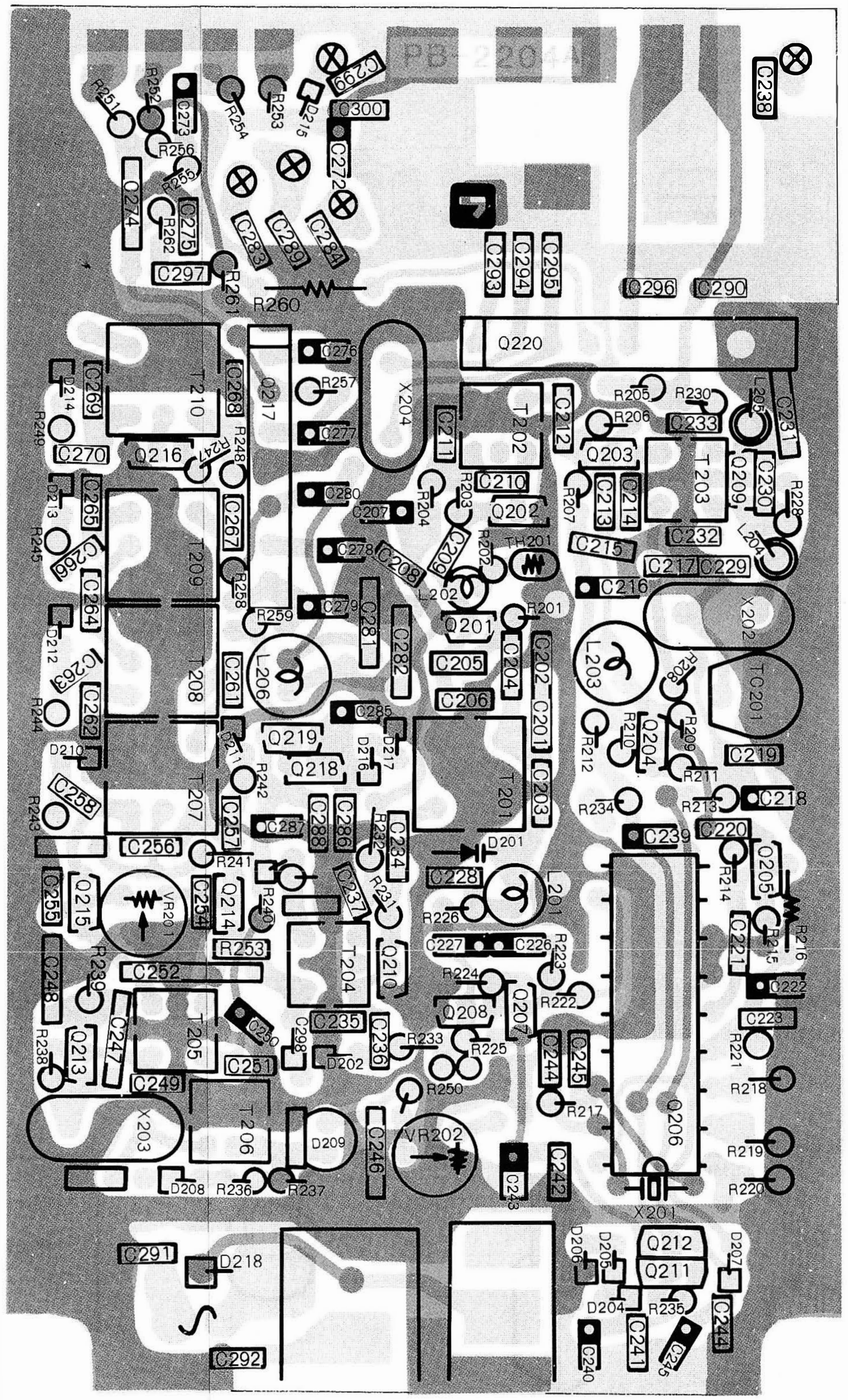
MC3357

Q109	1	2	3	4	5	6	7	8	9	10
	5.6	5.0	4.3	5.7	1.0	1.0	1.0	5.7	2.7	2.0
	11	12		13		14		15	16	MODE
	2.0	0.8/0.7		0/5.2		0.6/0		0	2.0	SQ OPEN/TIGHT

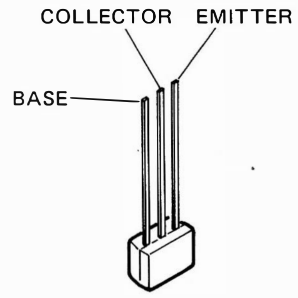
PLL UNIT PARTS LAYOUT



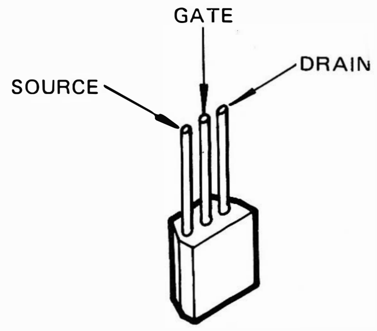
Viewed from component side



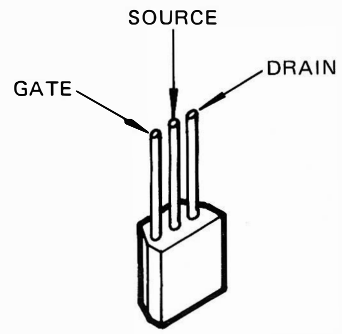
Viewed from solder side



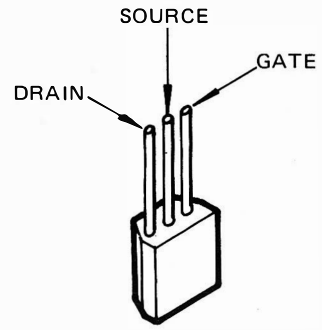
2SC2785E
2SC2786L



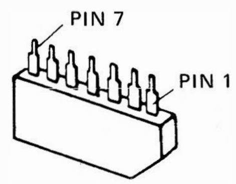
2SK184Y



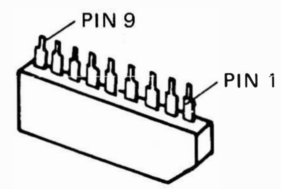
2SK192Y



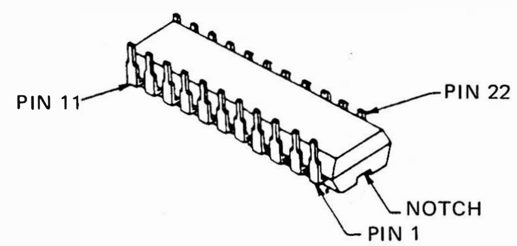
2SK193K



μPC577H



TC5082P
(MODEL B, C, D, E)



μPD2819C

PLL UNIT VOTAGE CHART

PLL UNIT
VOLTAGE CHART (DC VOLTS)

	B/G	C/D	E/S	MODE
Q201	0	5.3	0.9	RX/TX
Q202	0.7	3.4	0	RX/TX
Q203	6.7	9.4	6.0	RX/TX
Q204	6.7	8.7	6.0	RX/TX
Q205	0.9	2.3	0.2	RX/TX
Q207	0.4	0.6	6.5	RX/TX
Q208	0.6	3.6	0	RX/TX
Q209	0.7	4.7	0	RX/TX
Q210	0.7	3.6	0	RX/TX
Q211	7.1	10.4	6.5	RX/TX
Q212	6.5	10.4	5.8	RX/TX
Q213	2.8	3.8	2.1	TX
Q214	0	6.6	0.3	TX
Q215	0	6.6	0.3	TX
Q216	0.6	5.7	0	TX
Q218	7.6	10.8	6.9	TX
Q219	7.6	10.8	7.6	TX

Q206	1	2	3	4	5
	5 (VDD)	A.D.E.F. 5.76MHz B.C 7.2MHz	A.D.E.F 5.76MHz B.C 7.2MHz	0	A.D.E.F 90kHz B.C 112.5kHz
	6	7	8	9	10
	0	5		A.D.E.F 5kHz B.C 12.5kHz	A.D.E.F 5kHz B.C 12.5kHz
	11	12	13	14	15
	0	0	0 (VSS)		5
	16	17	18		
	0 (A)	0 (B)	0 (C)		

(A) CPS Shift register clock input
(B) DI Shift register data terminal
(C) CPL Latch clock terminal

Q217	1	2	3	4	5	6	7
	5.2	2.0	2.0	0	7.6	3.0	10.0

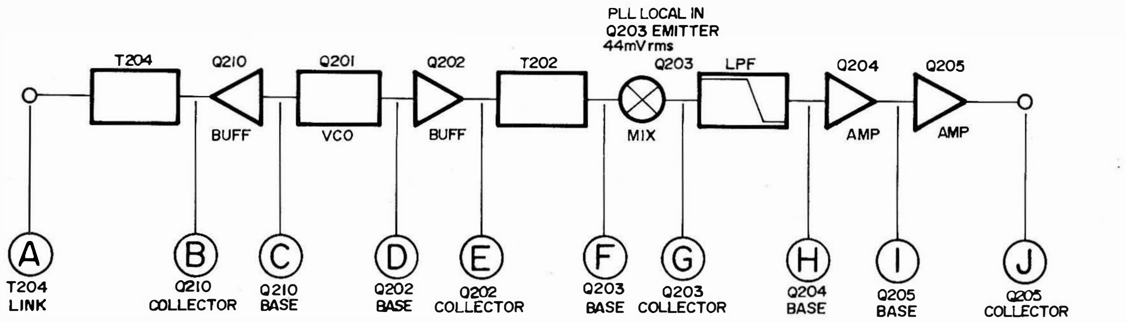
Q220	1	2	3	4	5	6	7
	1.4	2.4	2.6	3.4	6.9	3.4	3.4
	8	9					
	0	0					

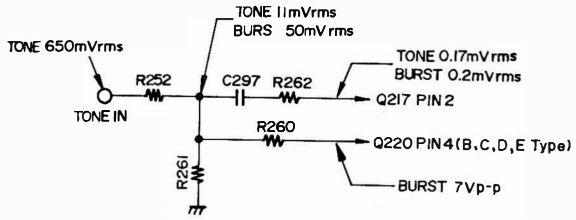
Model B, C, D, E ONLY

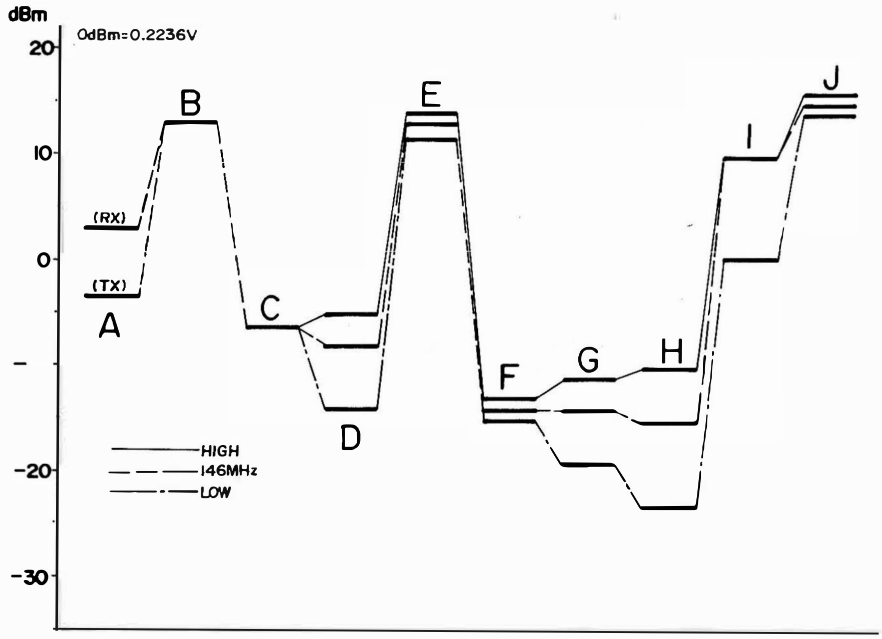
SEMICONDUCTOR REPLACEMENT

Location No.	ORIGINAL PART NO.	REPLACEMENT PART NO.
Q110, 112, 113, 118, 121, 122, 208, 211, 212, 219	2SC2785E G3327850E	2SC2785F G3327850F
Q111, 114, 117	2SA1175E G3111750E	2SA1175F G3111750F
Q204, 205	2SC2786L G3327860L	2SC535B G3305350B
Q210	2SC2786L G3327860L	2SC1674C G3316740C
Q214, 215, 218	2SK193F G3801930F	2SK193K/2SK193P G3801930K/G3801930P

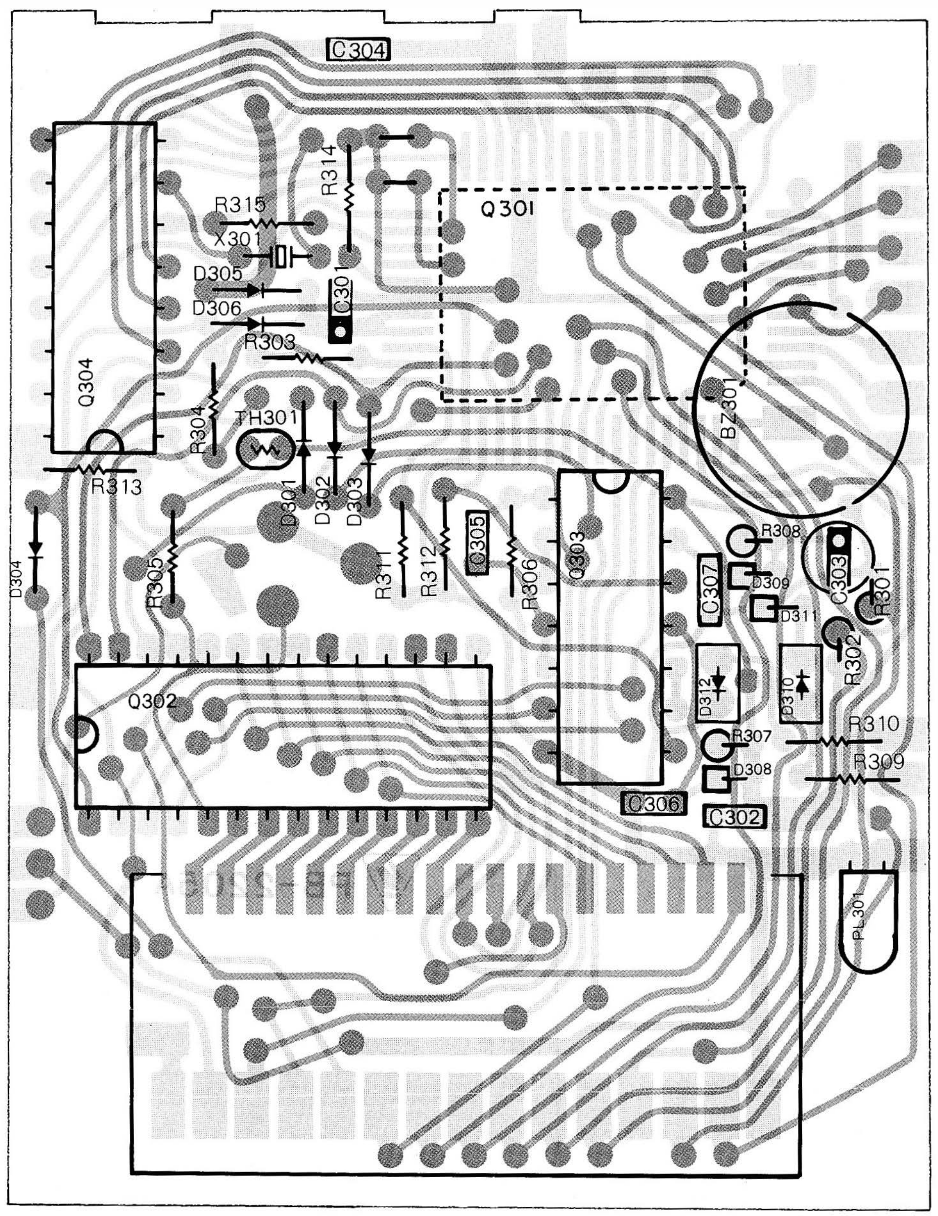
LEVEL DIAGRAM PLL SECTION



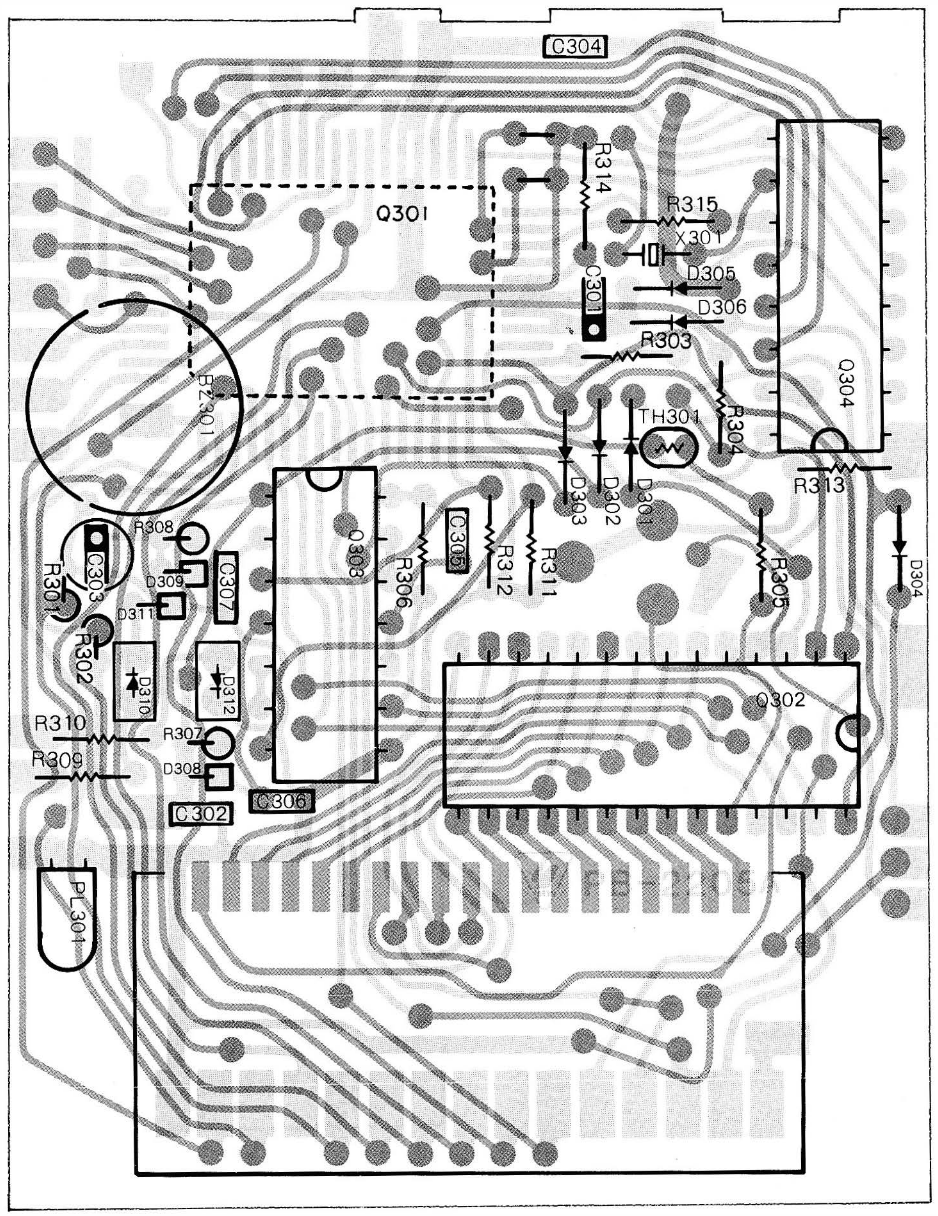




CONTROL UNIT PARTS LAYOUT
Prod.Lot(Seriol No.010001-069999)

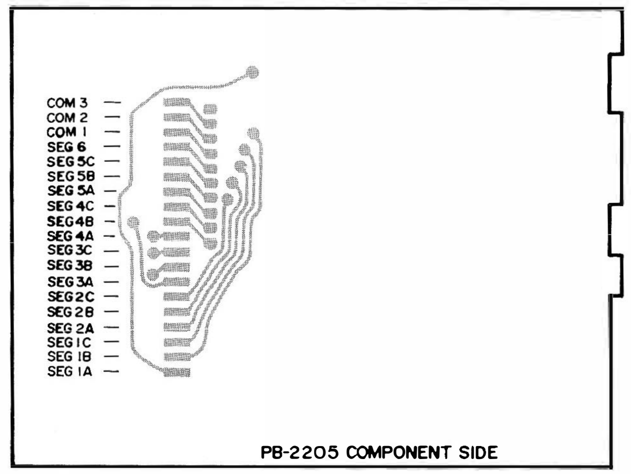


Viewed from component side

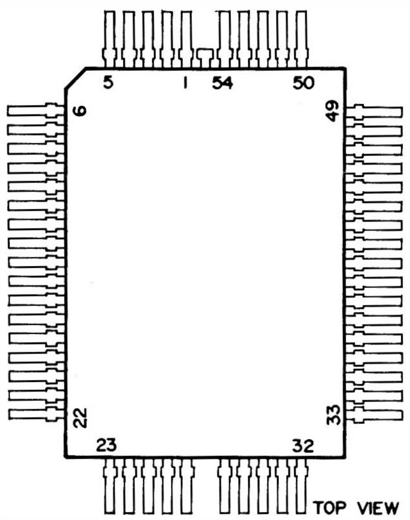


Viewed from CPU (Q_{301}) side

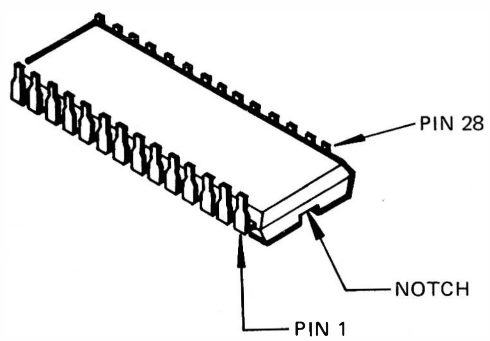
When replacing the Backup Lithium Battery never allow your skin to touch the battery, as the battery will pick up oil from the skin and thus have its lifetime shortened due to current leakage through the oil.



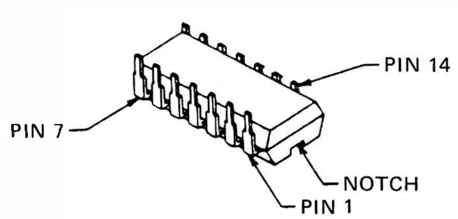
Prod.Lots 1—6 (Ser.Nos 01XXXX–06XXXX)



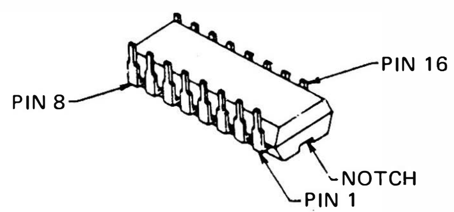
HD44820A07



TP0401

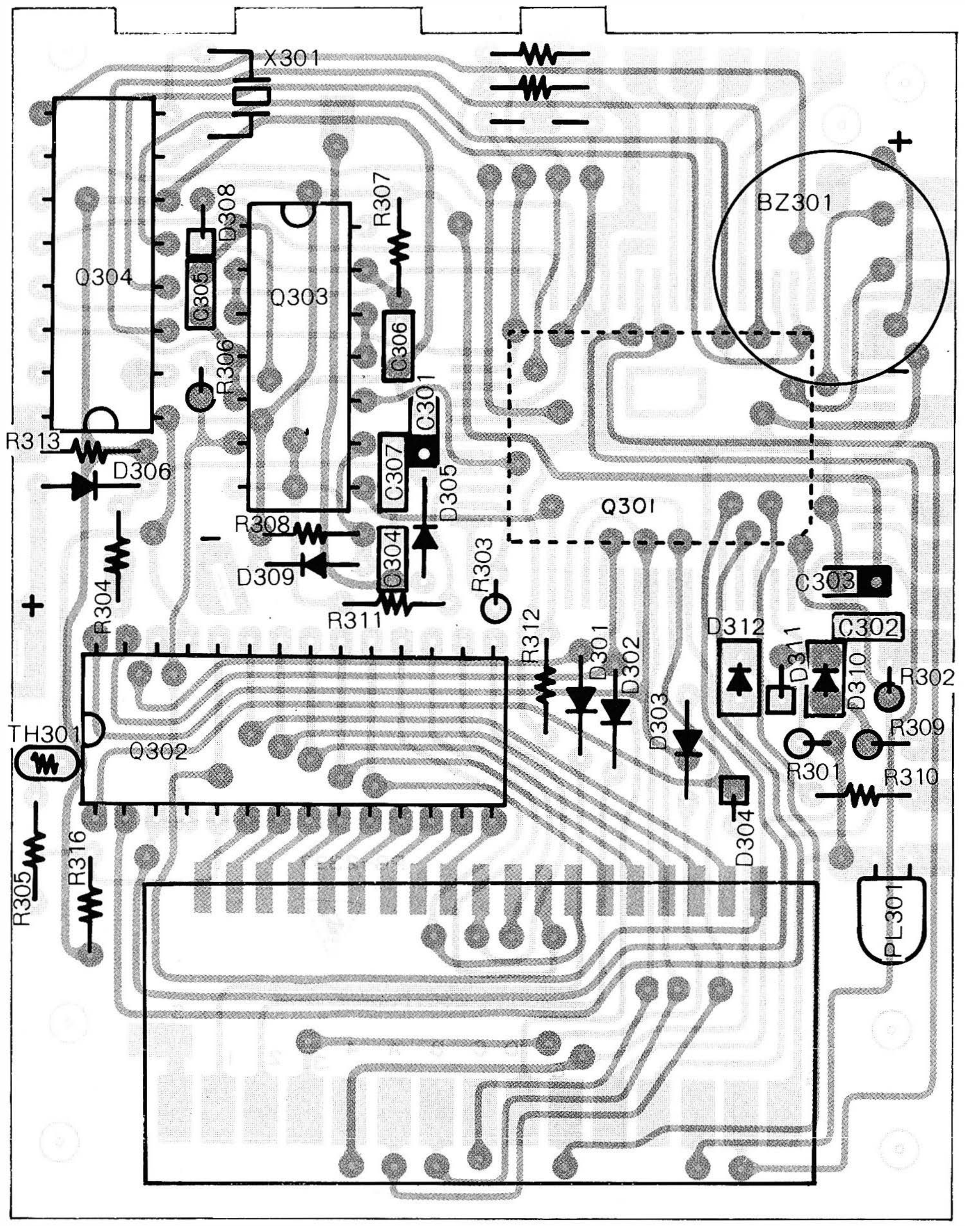


MC14069B

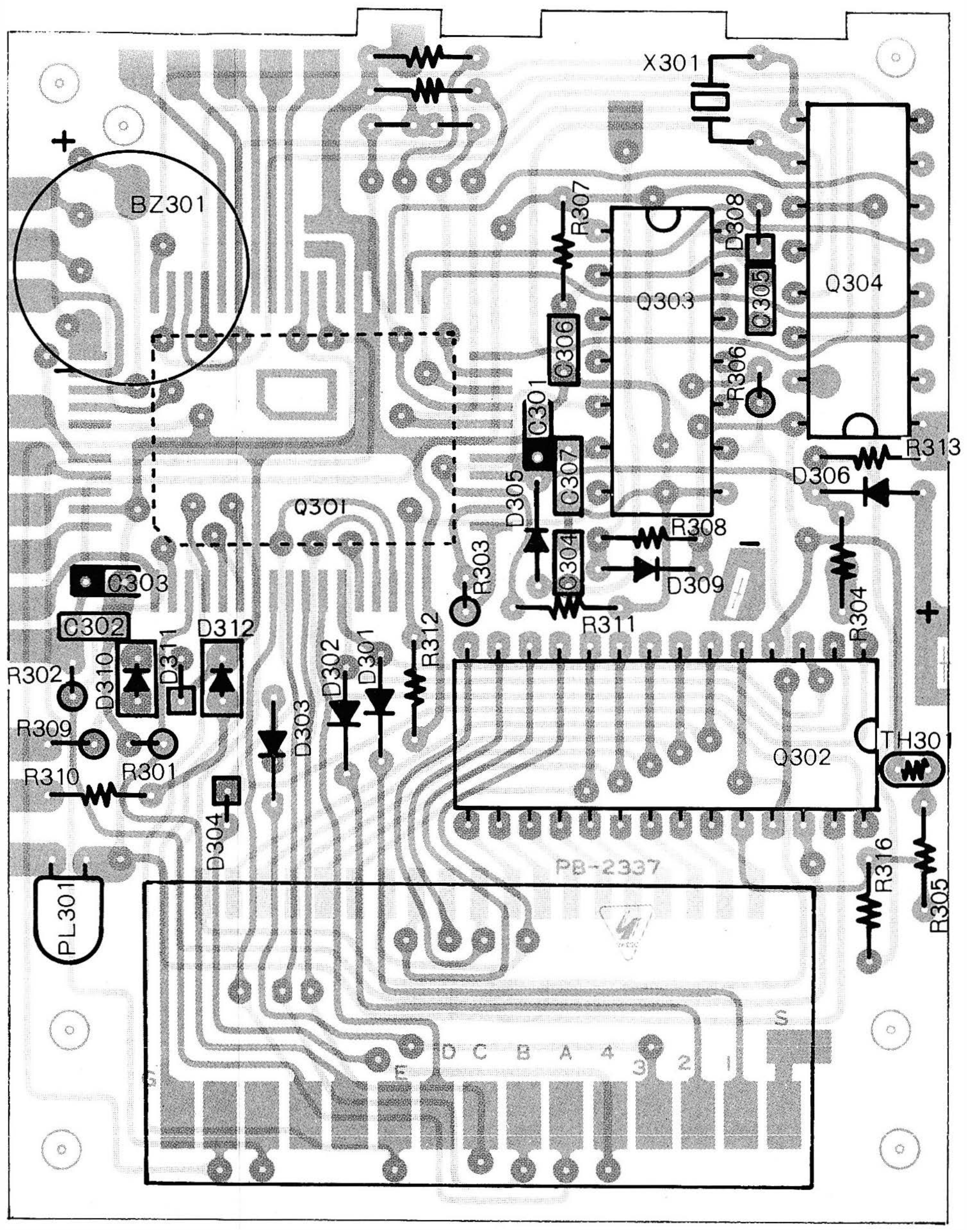


MK5087

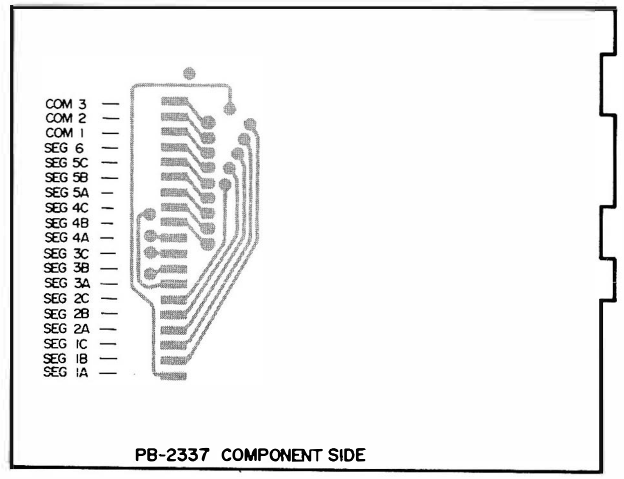
CONTROL UNIT PARTS LAYOUT
Prod.Lot(Seriol No.070001&UP)



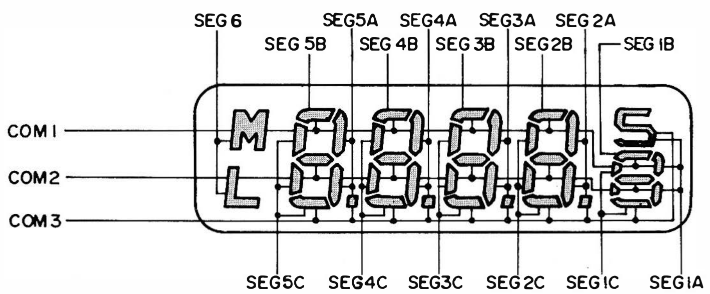
Viewed from component side



Viewed from CPU (Q_{301}) side



Prod.Lot 7 & UP (Ser Nos 07XXXX)



LCD DISPLAY PIN NO.	COM1	COM2	COM3	SEG1A	SEG1B	SEG1C	SEG2A	SEG2B	SEG2C	
LCD DRIVER PIN NO. (Q302)	8	7	6	24	23	22	21	20	19	

LCD DISPLAY PIN NO.	SEG3A	SEG3B	SEG3C	SEG4A	SEG4B	SEG4C	SEG5A	SEG5B	SEG5C	SEG6
LCD DRIVER PIN NO. (Q302)	18	17	16	15	14	13	12	11	10	9

CONTROL UNIT
VOLTAGE CHART (DC VOLTS)

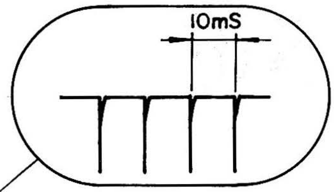
Q304 MK5087

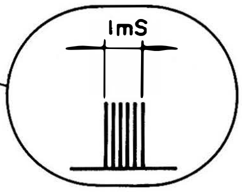
Pin No.	1	2	3	4	5	6	7	8
Normally	5V	H	L	L	L	G	L	H
TX KEY ON	5V	L	(H)	(H)	(H)	G	3.58MHz	3.58MHz

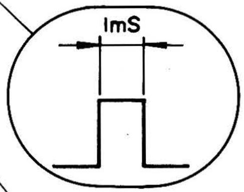
Pin No.	9	10	11	12	13	14	15	16
Normally	L	L	H	H	H	H	H	L
TX KEY ON	(H)	H	(L)	(L)	(L)	(L)	H	TONE OUT 3Vp-p

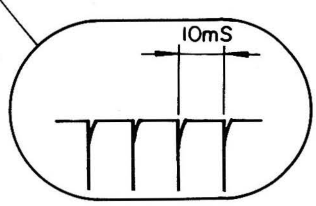
Q301 CPU HD44820-A07

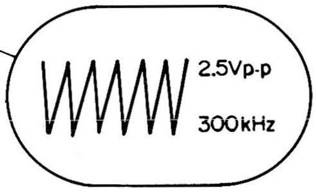
PIN	PORT	I/O		FUNCTION/WAVE FORM
1	D4	$\overline{TX}$	O	TX "L"
2	D5	TX	O	TX "H"
3	D6	$\overline{PTT}$	I	PTT Press "L"
4	D7	N.C		GND
5	D8	$\overline{DOWN}$	I	Not used (Normally "H")
6	D9	$\overline{UP}$	I	Not used (Normally "H")
7	D10	$\overline{SCANSTOP}$	I	BUSY STOP STOP "L"
8	D11	SCANSTOP	I	CLEAR STOP STOP "H"
9	D12	KEY-E	O	KEY (E) ROW OUT (Normally "L") KEY ON
10	D13	STD	O	LCD DRIVER STROBE Normally "L"
11	D14	CE	O	LCD DRIVER ENABLE Normally "L"
12	D15	NC		GND
13	R40	KEY-A	O	KEY (A) ROW OUT Normally "L"
14	R41	KEY-B	O	KEY (B) ROW OUT Normally "L"
15	R42	KEY-C	O	KEY (C) ROW OUT Normally "L"
16	R43	KEY-D	O	KEY (D) ROW OUT Normally "L"
17	R50	KEY 1 LCD4	I/O	KEY → IN LCD → OUT Normally "H"
18	R51	KEY 2 LCD3	I/O	KEY → IN LCD → OUT Normally "H"
19	R52	KEY 3 LCD2	I/O	KEY → IN LCD → OUT Normally "H"
20	R53	KEY 4 LCD1	I/O	KEY IN LCD OUT Normally "H"
21	RESET		I	POWER ON RESET Normally "L" Pulse width 10msec
22	GND			GND
23	OSC 1			300kHz 2.5Vp-p
24	OSC 2			400kHz 5Vp-p
25	$\overline{HLT}$		I	POWER ON "H"
26	$\overline{TEST}$		I	VCC
27	VCC			+5V (Backup +2.3V)
28	R00		I	Model A–E select (See frequency range modification.)
29	R01		I	
30	R02		I	
31	R03		I	
32	R10	ROW 1	O	DTMF ROW OUT (A) ROW (TX) "L"
33	R11	ROW 2	O	DTMF ROW OUT (B) ROW (TX) "L"
34	R12	ROW 3	O	DTMF ROW OUT (C) ROW (TX) "L"
35	R13	ROW 4	O	DTMF ROW OUT (D) ROW (TX) "L"
36	INT0		I	Not used (GND)
37	INT1		I	Not used (GND)
38	R20	BZ OFF	I	"L" TX KEY IN ALARM STOP
39	R21	LOCK	I	"L" KEYBOARD LOCK
40	R22	X2	I	"L" DOUBLE STEP SCAN
41	R23	M.S	I	"L" MEMORY SPLIT
42	R30	–SET	I	"L" –SET SHIFT
43	R31	–RPT	I	"L" –RPT SHIFT
44	R32	+RPT	I	"L" +RPT SHIFT
45	R33	+SET	I	"L" +SET SHIFT
46	R60	COL1	O	DTMF COLUMN OUT PRESS COLUMN 1 "H" (TX)
47	R61	COL2	O	DTMF COLUMN OUT PRESS COLUMN 2 "H" (TX)
48	R62	COL3	O	DTMF COLUMN OUT PRESS COLUMN 3 "H" (TX)
49	R63	COL4	O	DTMF COLUMN OUT PRESS COLUMN 4 "H" (TX)
50	D0	BZ	O	ALARM TONE OUT 5kHz signal (100msec).
51	D1	CPL	O	PLL LATCH PULSE
52	D2	CPS	O	PLL CLOCK PULSE
53	D3	DI	O	PLL DIVIDE DATA
54	NC			

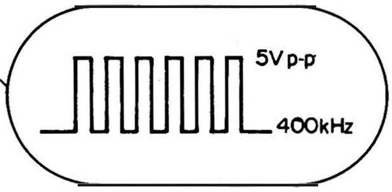


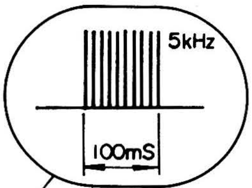


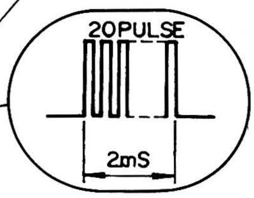




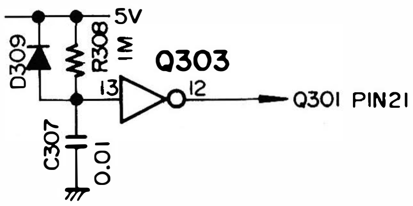


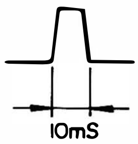




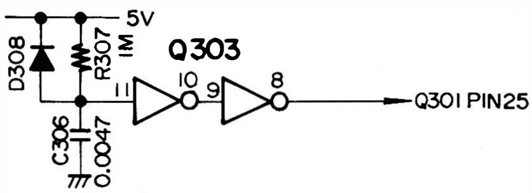


POWER ON RESET PULSE CIRCUIT

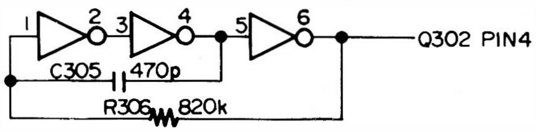


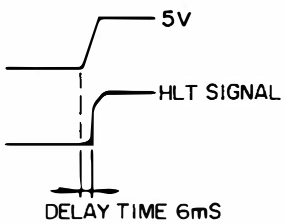


HLT PULSE GENERATOR



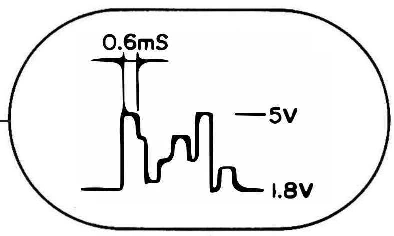
FRAME CLOCK OSCILLATOR CIRCUIT



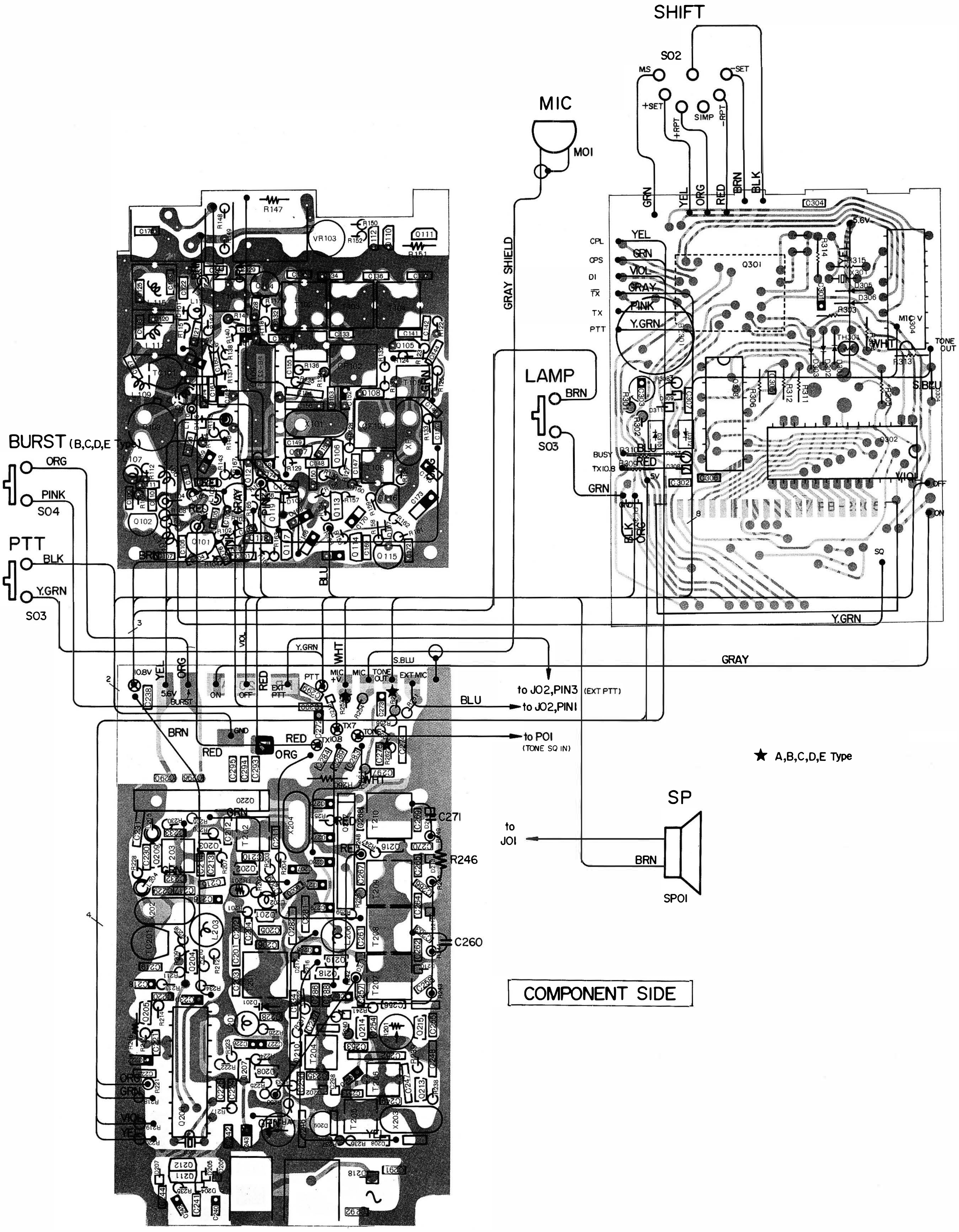


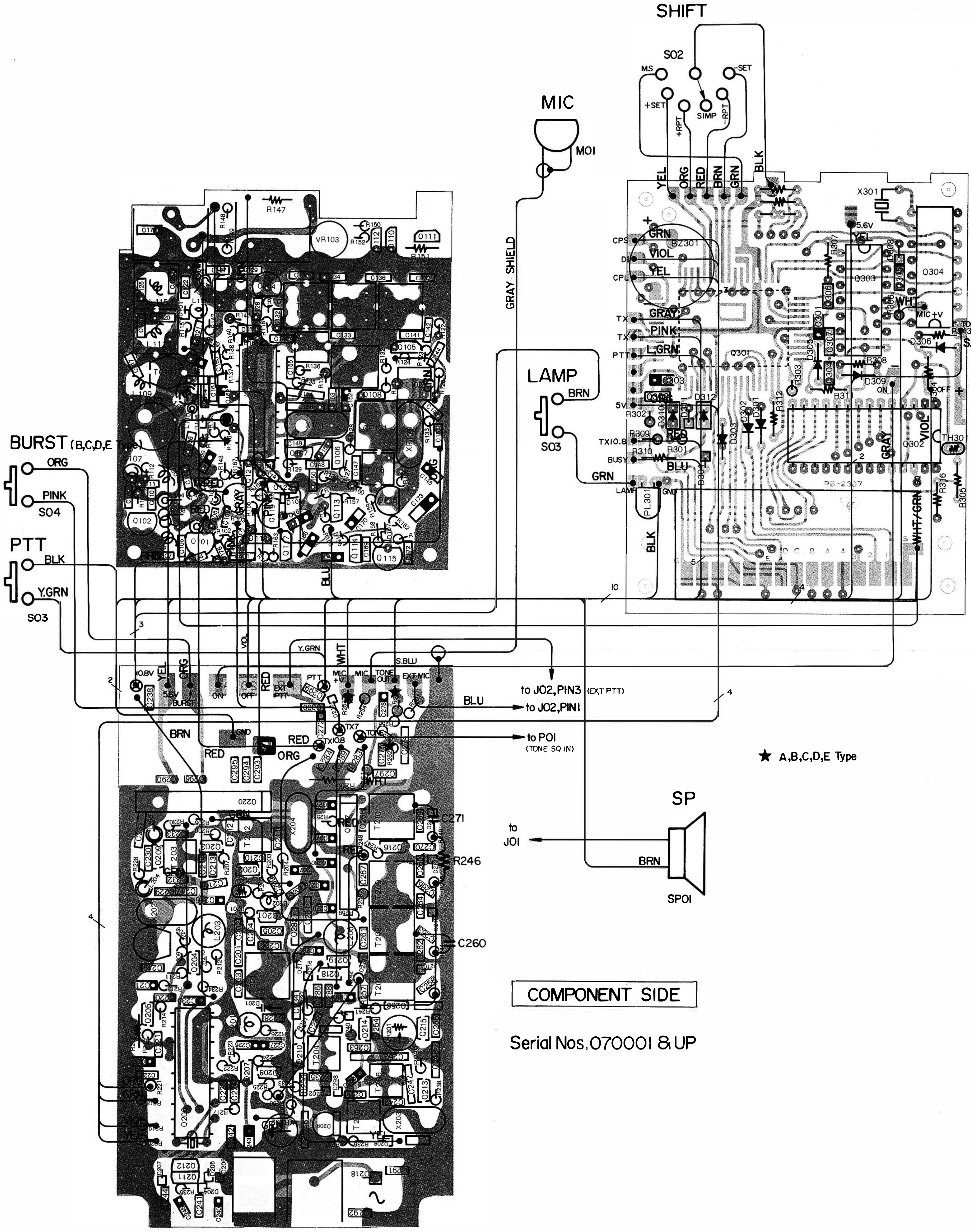
Q302 LCD DRIVER TP0401

PIN No.	PORT	FUNCTIONS/WAVE FORMS
1	D1	DATA INPUT 1 Normally "H"
2	STD	STROBE Normally "L"
3	CE	CHIP ENABLE Normally "H"
4	FC	FLAME CLOCK
5	Vss	LCD DRIVING VOLTAGE 1.8V
6, 7, 8	COM1, 2, 3	COMMON OUTPUT
10–14	SEG	SEGMENT OUT
15–24	SEG	SEGMENT OUT
25	V_{DD}	+5V
26	D4	DATA INPUT 4 Normally "H"
27	D3	DATA INPUT 3 Normally "H"
28	D2	DATA INPUT 2 Normally "H"



WIRING DIAGRAM (1)

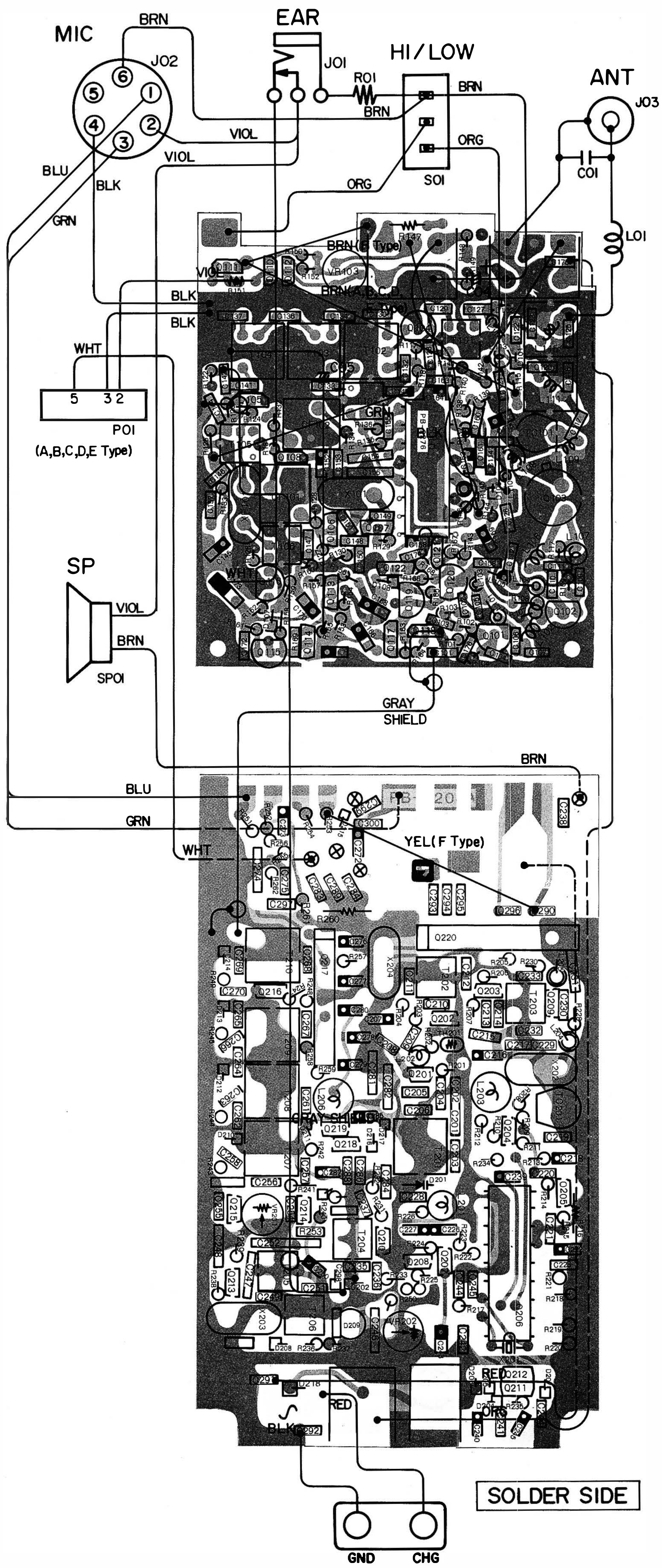




COMPONENT SIDE

Serial Nos. 070001 & UP

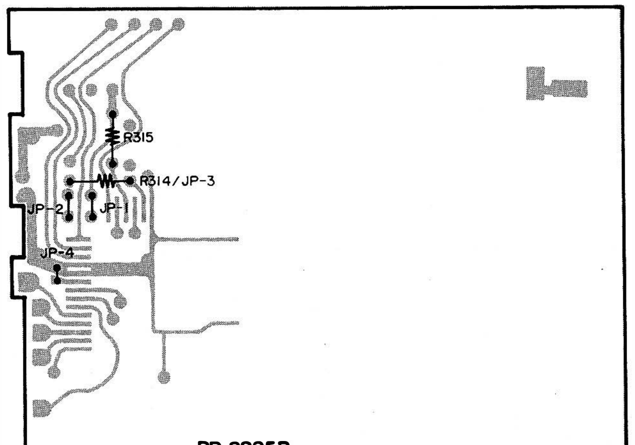
WIRING DIAGRAM (3)



MODIFICATIONS

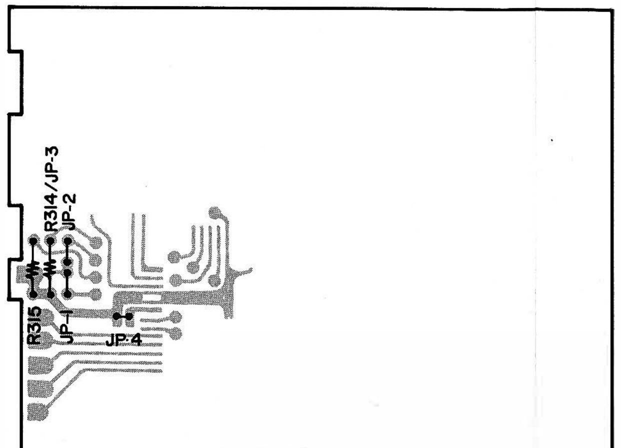
FREQUENCY RANGE MODIFICATIONS

This modification will enable your transceiver to operate within the frequency range and with the channel spacing required for use in your particular area. Please refer to the diagram and chart below for details.



PB-2205B (Viewed from Solder Side)

Prod.Lots 1 — 6 (Ser.Nos 01xxxx – 06xxxx)



PB-2337 (Viewed from Solder side)

Prod.Lot 7 & UP (Ser.Nos 07xxxx)

X201			
TYPE	YAESU PN.	FREQUENCY	
A,D,E,F	H0102408	HC-18T	5.76MHz
B,C	H0102409	〃	7.2MHz

X202			
TYPE	YAESU PN.	FREQUENCY	
A,D,E	H0102403	HC-18T	125.595MHz
B,C	H0102405	〃	124.5875MHz
F	H0102404	〃	126.095MHz

FREQUENCY RANGE MODIFICATION

	Type A	Type B	Type C	Type D	Type E	Type F
BAND (MHz)	144.0 — 147.995	144.0 — 145.9875	144.0 — 147.9875	144.0 — 147.995	144.0 — 147.995	144.0 — 145.99
PRESET (MHz)	147.0	145.0	145.0	145.0	147.0	145.0
CH.STEP (Hz)	5k/10k	12.5k/25k	12.5k/25k	5k/10k	5k/10k	10k/20k
JP-1	O	O	O	X	O	X
JP-2	X	O	O	X	X	X
JP-3/R314	O	X	O	O	O	———
JP-4	X	X	X	X	X	O
R314	X	X	X	X	X	Carbon film 1/8W, 5.6kΩ
R315	X	X	X	X	X	Carbon film 1/8W, 5.6kΩ

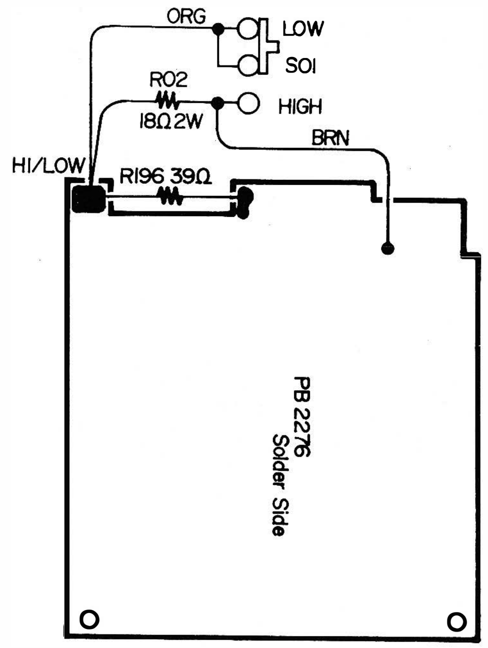
NOTE:
1. "O" in the above table indicates that a jumper wire (or resistor) should be installed.
2. Some models use a resistor between the points indicated in this connection, while other models use simply a jumper wire (JP-3)
3. Type A transceivers can have their range extended to 143.5 – 148.495 MHz by removing jumper JP-3.
4. Except for R314 (if used), all jumper wires and R315 are located on the component side of the board.

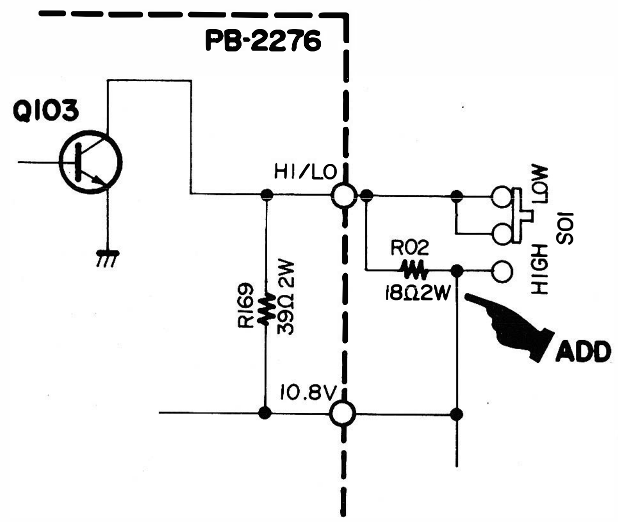
MODIFICATION OF THE FT-208R FOR 1 WATT OUTPUT IN THE LOW POWER POSITION

Although the specification for LOW power output from the FT-208R is 0.3 watt, with this modification the LOW power output will be approximately 1 watt.

Parts needed: one 18 ohm, 2 watt metallic film resistor with insulating sleeve over the body of the resistor.

1. Connect the 18 ohm resistor between the HI/LOW switch terminal to which the brown wire is connected and the point on the pattern of the Main Unit circuit board shown in the drawing. Leave the brown wire connected as before. This completes the modification.





MAINTENANCE AND ALIGNMENT

GENERAL

The FT-208R has been carefully aligned and tested at the factory prior to shipment. The solid state discrete devices and integrated circuits used in the FT-208R should provide many years of trouble-free service, if the transceiver is not abused and if routine maintenance is carried out.

Periodic cleaning of the interior of the transceiver may be required if the unit is used in a dusty environment. A vacuum cleaner may be used to remove loose dirt, while a small brush will help in dislodging caked dirt. The exterior may be wiped with a damp cloth whenever necessary.

Should feeble power output or degraded receiver sensitivity indicate the need for alignment, we recommend that the transceiver be returned to your Yaesu dealer, as the test equipment and expertise required to align the FT-208R can be obtained there. Any attempt to align this transceiver without the proper equipment and knowledge may result in seriously degraded performance.

ALIGNMENT

Equipment Required:

- Signal generator good to 150 MHz
- Audio voltmeter
- VTVM
- VOM
- Audio oscillator
- Oscilloscope
- Linear detector (deviation meter)
- Dummy load/wattmeter (50 ohms, 150 MHz)
- Frequency counter good to 150 MHz
- Directional coupler
- Spectrum analyzer

I. PLL Alignment

A. VCO Alignment

1. Connect a DC voltmeter to the collector of Q_{208} (2SC2785E).
2. Set the transceiver to 144.000 MHz.
3. Adjust the core of T_{201} for a reading of exactly 1.5 volts on the voltmeter.
4. Now set the transceiver to 147.995 MHz (145.975 MHz or 147.975 MHz), and check to see that the DC voltmeter shows more than 5.5 volts.

B. PLL IF Alignment

1. Set the transceiver to 147.995 MHz (145.975 MHz or 147.975 MHz).
2. Connect the RF probe of a VTVM to the collector of Q_{205}, and adjust the cores of T_{202} and T_{203} for maximum deflection on the VTVM. The nominal value is approximately 1 volt rms.

C. PLL Local Frequency Adjustment

1. Set the transceiver to 146.000 MHz (Model A, C, D, E) or 145.000 MHz (Model B).
2. Connect a frequency counter to the cathode of D_{219} and adjust TC_{201} for a reading of exactly 129.100 MHz (128.100 MHz).
3. Now set the frequency to 144.000 MHz, and check to see that the frequency counter shows a frequency of exactly 127.100 MHz. Then set the transceiver frequency to 147.995 MHz (145.975 MHz or 147.975 MHz), and check to see that the counter frequency is 131.095 MHz (129.075 MHz or 131.075 MHz).

D. PLL Output Coil Alignment

1. Set the transceiver to 147.995 MHz (145.975 MHz or 147.975 MHz).
2. Connect the RF probe of a VTVM to the cathode of D_{219}, and adjust the core of T_{204} for a maximum reading on the VTVM. The nominal value is approximately 300 mV rms.

E. TX Bandpass Filter Alignment

1. Set the transceiver to 147.995 MHz (145.975 MHz or 147.975 MHz).
2. Connect a dummy load to the ANT connector, and connect the RF probe of a VTVM to the secondary of T_{210}.
3. Now close the PTT switch and adjust the cores of T_{206} through T_{210} for a maximum reading on the VTVM. The nominal value is approximately 300 mV rms.

F. TX Frequency Adjustment

1. Set the transceiver to 146.000 MHz (145.000 MHz).
2. Connect a frequency counter to the secondary of T_{210}, and adjust the core of T_{205} for a reading of exactly 146 MHz (145 MHz).

II. Receiver Alignment

A. 1st, 2nd IF Alignment

1. Connect a signal generator to the ANT connector, and set the frequency to 146 MHz (145 MHz) with 1 kHz modulation @±3.5 kHz deviation, and the output level to 20 dB (ref: 0 dB = 1 μV). Connect an oscilloscope to the earphone jack as shown in Figure 1.

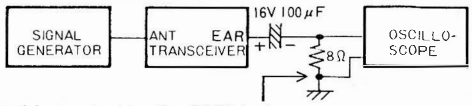
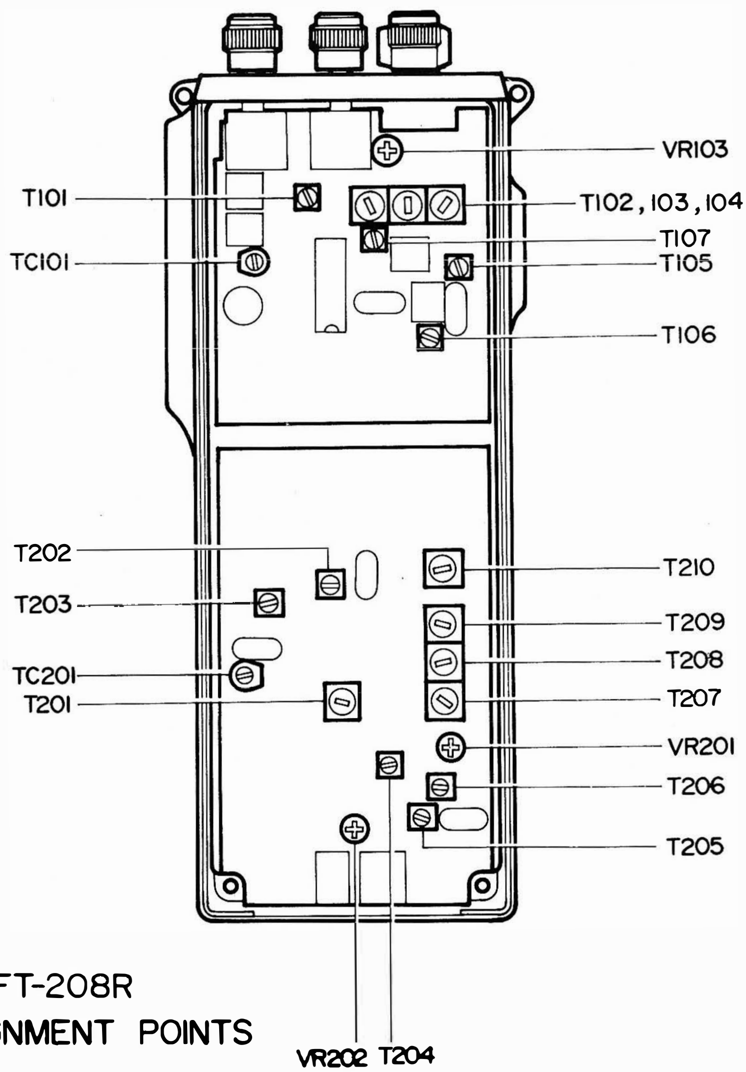


Figure 1

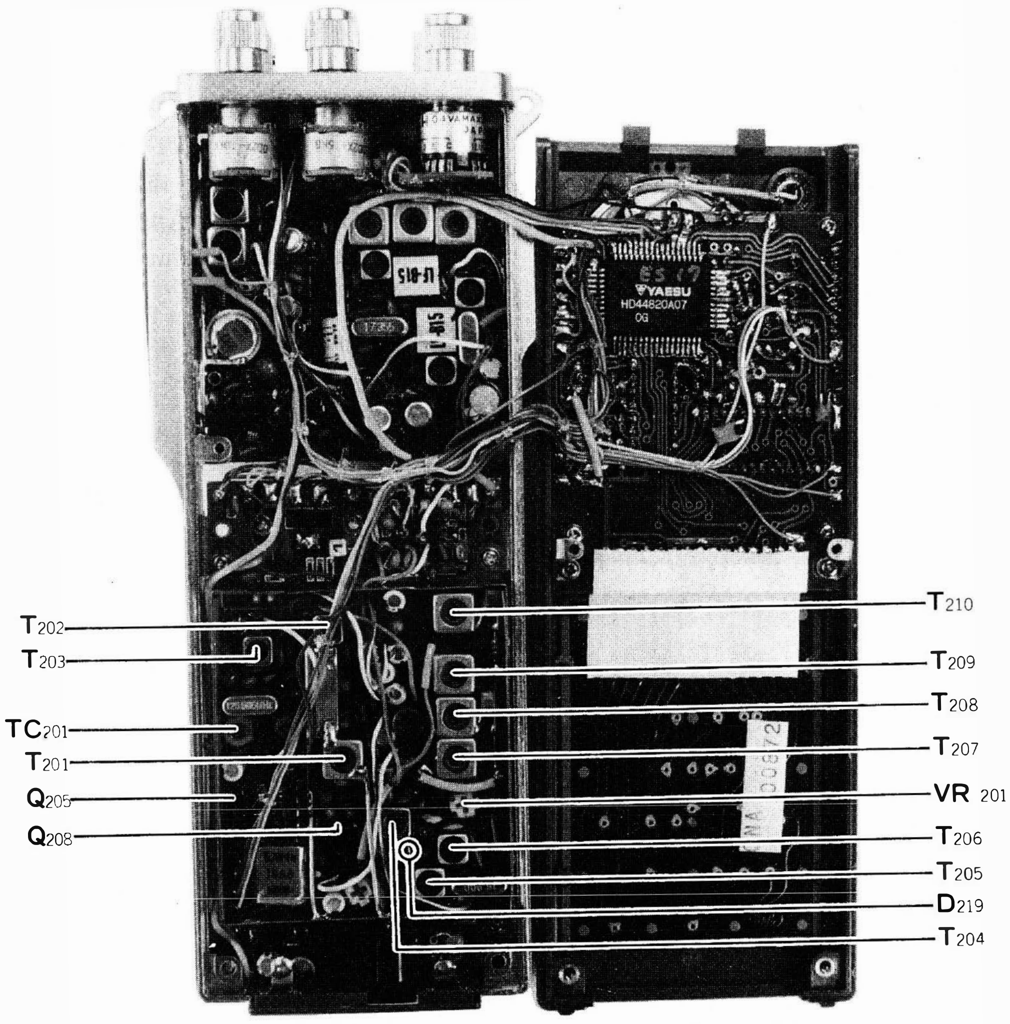
2. Adjust the cores of T_{105}, T_{106} and T_{107} until a minimum distortion pattern and maximum output are observed on the oscilloscope.

B. RF Coil Adjustment

1. Set the transceiver frequency and signal generator to 147.995 MHz (145.975 MHz or 147.975 MHz), and adjust T_{101}, T_{102}, T_{103} and T_{104} for minimum distortion and maximum amplitude on the oscilloscope. Now, set the transceiver frequency to 144.000 MHz, and again adjust T_{101} through T_{104}. Repeat this alignment at both lower and upper band edges until maximum sensitivity is obtained on both band edges.



FT-208R
ALIGNMENT POINTS



PLL SECTION ALIGNMENT POINTS

C. Squelch Adjustment

1. Apply a –8 dB signal with 1 kHz modulation @ ±3.5 kHz deviation to the ANT jack, and set the frequency to 146 MHz (145 MHz). Then set the transceiver to the same frequency.
2. Rotate the SQL control knob fully counterclockwise, and adjust VR_{103} so that the squelch just opens.

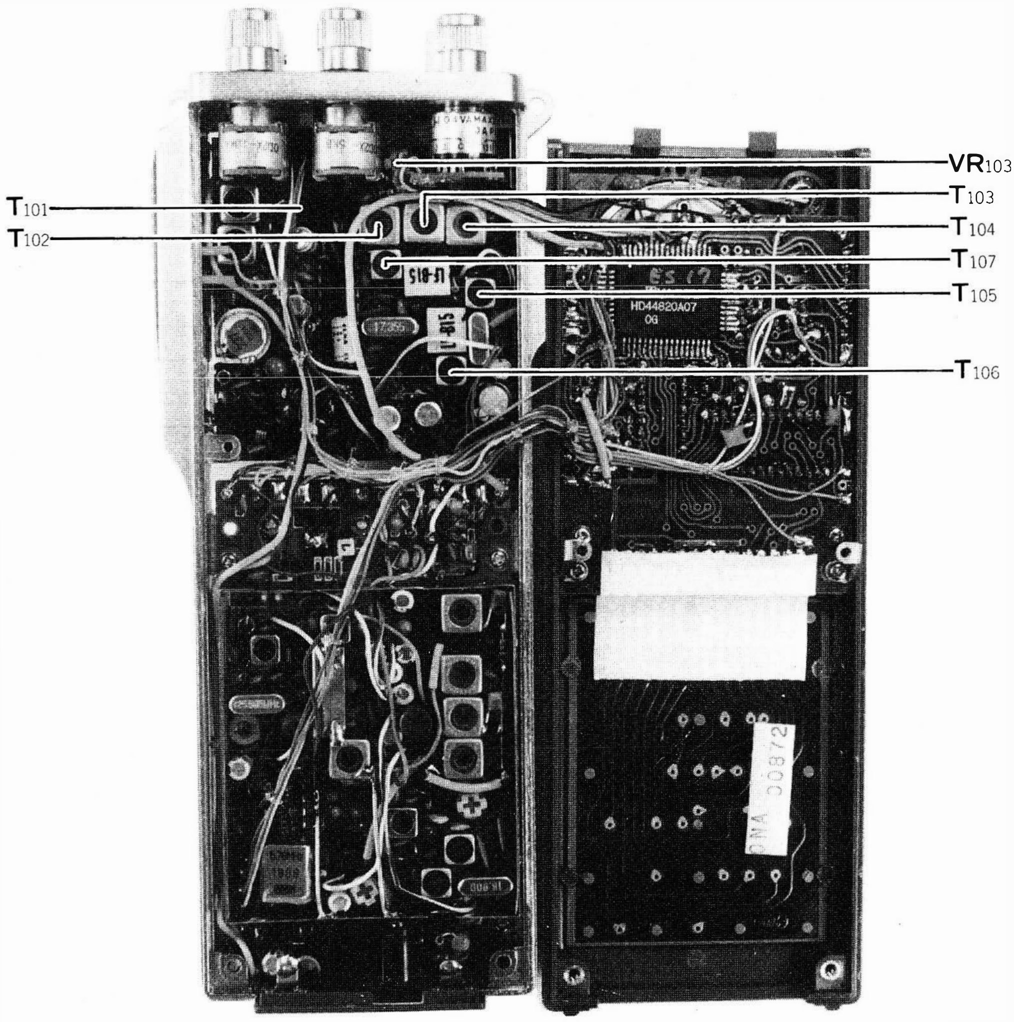
III. Transmitter Alignment

A. Power Amplifier Alignment

1. Connect a dummy load/wattmeter to the ANT jack, and set the transceiver to 146 MHz (model B 145 MHz).
2. Connect a DC voltmeter to the emitter of Q_{101}. Refer to the Transmitter Section Alignment Point photo on the next page.
3. Set the HI/LOW switch to the LOW position and close the PTT switch. Now adjust T_{204}, T_{206}, T_{207}, T_{208}, T_{209} and T_{210} for maximum DC voltage on the meter.
4. Set the HIGH/LOW switch to the HIGH position, and adjust L_{102}, L_{106} and TC_{101} for a maximum RF power reading on the wattmeter.

B. Deviation Adjustment

1. Connect a dummy load through a directional coupler to the ANT jack, and a portion of the output from the directional coupler to the deviation meter. Apply a 1 kHz 25 mV signal to the external microphone connector from an audio oscillator.
2. Adjust VR_{202} for a deviation of ±4.5 kHz on the deviation meter (refer to Figure 2).



RECEIVER SECTION ALIGNMENT POINTS

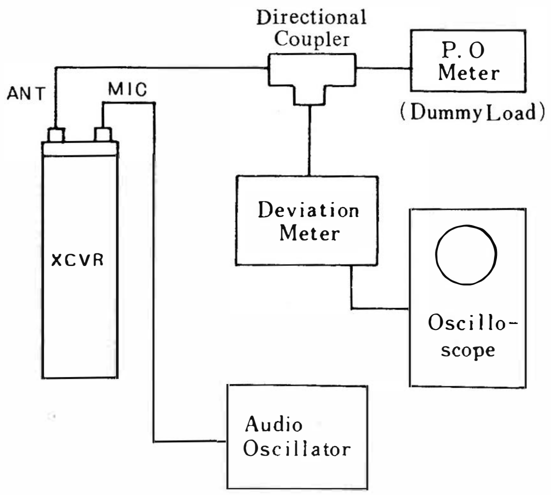
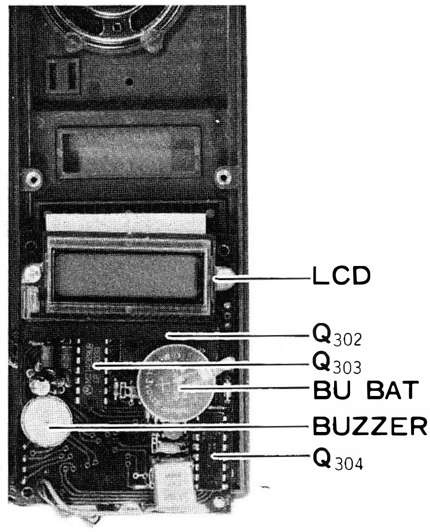
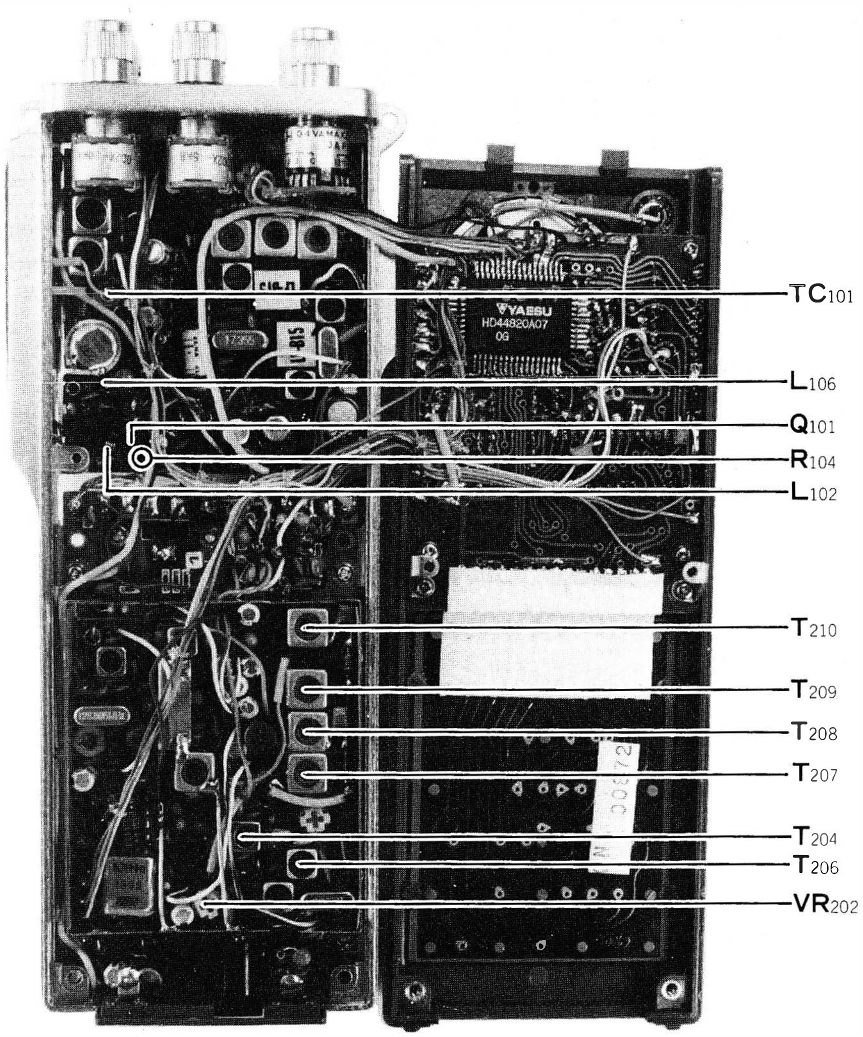
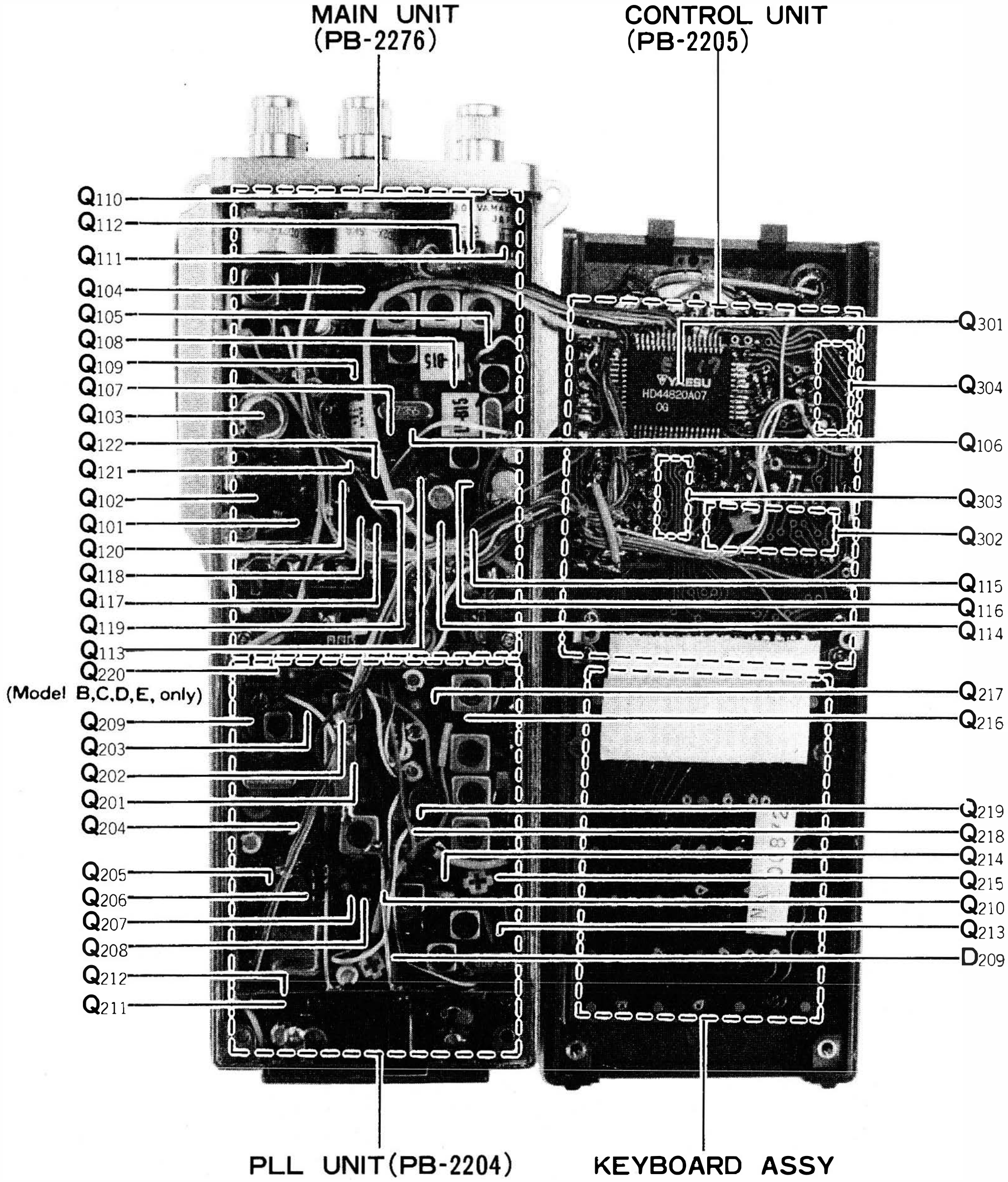


Figure 2





TRANSMITTER SECTION ALIGNMENT POINTS


MAIN UNIT
(PB-2276)
CONTROL UNIT
(PB-2205)
Q110
Q112
Q111
Q104
Q105
Q108
Q109
Q107
Q103
Q122
Q121
Q102
Q101
Q120
Q118
Q117
Q119
Q113
Q220
(Model B,C,D,E, only)
Q209
Q203
Q202
Q201
Q204
Q205
Q206
Q207
Q208
Q212
Q211
Q301
Q304
Q106
Q303
Q302
Q115
Q116
Q114
Q217
Q216
Q219
Q218
Q214
Q215
Q210
Q213
D209
YAESU
HD44820A07
PLL UNIT(PB-2204)
KEYBOARD ASSY

SOLDERING TECHNIQUE

SOLDERING AND DESOLDERING TECHNIQUE ON PRINTED CIRCUIT BOARDS

The FT-208R circuit boards are tough, but mishandling during soldering can cause circuit traces to "lift." While this does not cause permanent damage to the board, much servicing trouble can result, because of the tendency for this lifted trace to break. A few simple precautions will keep your circuit boards in A-1 condition.

1. Use only a 12 to 30 watt chisel-tip soldering iron. Yes, some "repairmen" have been known to use small blowtorches on cards.
2. Use only a soldering iron equipped with a three-wire cord, with the tip grounded. Also acceptable is a soldering iron isolated through a transformer. An old soldering iron or gun may have 117 volts on the tip, and will certainly cause more damage than it repairs!
3. USE ONLY 60/40 ROSIN CORE SOLDER. Acid core solder should be thrown away if you find it in your radio shop!
4. Use a solder sucker and solder tape to ensure a professional repair job.
5. If you do lift a trace, don't worry! Read on to find out how to repair traces like a pro.

NOTES ON USE OF CMOS IC'S:

As CMOS devices are extremely sensitive to damage from static electricity, special precautions must be observed.

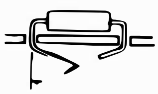
In storage, use only sponge specially designed for CMOS components.

When installing a CMOS IC in a socket, or on a circuit board, be certain that the power is off. In addition, the technician should rest his hand on the chassis as the component is inserted, so as to place his hand at the same potential as the chassis (better to discharge small amounts of static electricity through your fingers than through a $5 IC!).

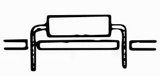
When soldering a CMOS IC onto a circuit board, use a low wattage iron, and be sure to ground the tip with a clip lead, if the tip is not grounded through a three-wire power cord.

INSERTION OF PARTS ON CIRCUIT BOARDS

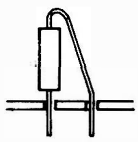
All of the below are acceptable ways of inserting components into circuit board mounting holes.



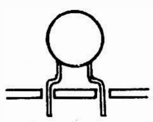
(a) Bend leads slightly



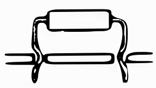
(b) Straight-in mounting



(c) Vertical mounting

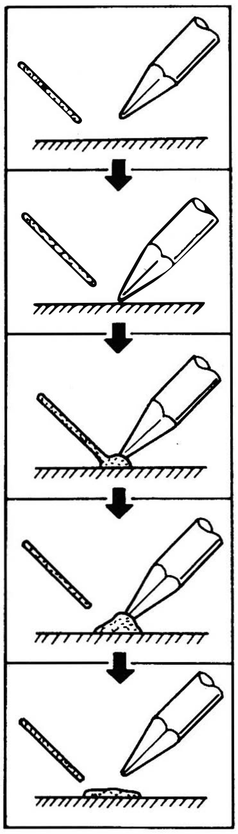


(d) Preformed disc ceramic capacitor



(e) Preformed resistor, diode, etc.

BASIC SOLDERING PRACTICE



(1) Prepare soldering iron and solder.

(2) Apply soldering iron to surface to be soldered.

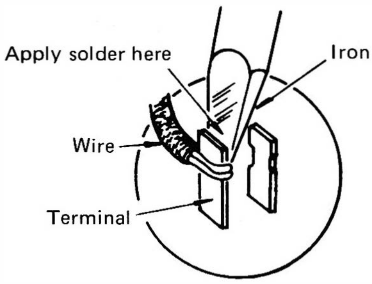
(3) Apply solder to heated surface.

(4) When enough solder is applied, remove solder. Continue to apply heat until solder flows cleanly.

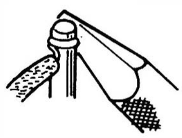
(5) Remove iron from work. Do not apply more heat than necessary for good solder flow.

Soldering to terminal posts:

(Be certain to apply heat to both post and wire.)

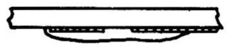




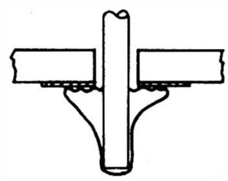


EXAMPLES OF POOR SOLDERING PRACTICE

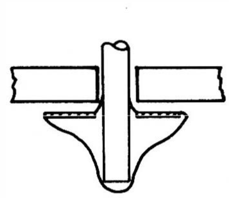
Solder bridge (caused by use of too much solder)



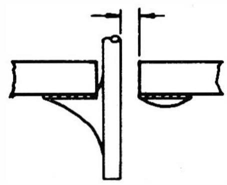
"Cold joint" (caused by insufficient heat to part of work, resulting in poor solder flow)



Lifted trace (caused by too much heat on circuit board foil)

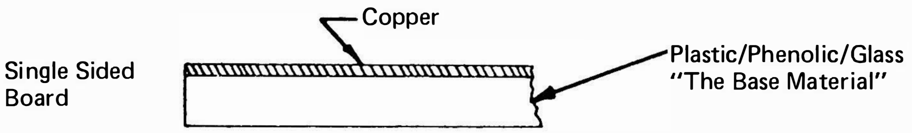


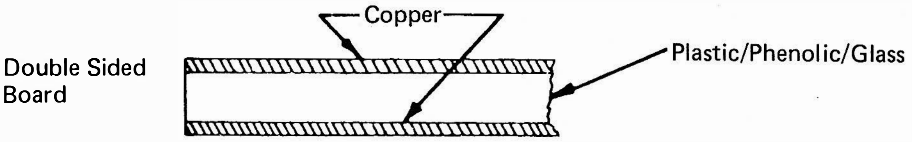
Unstable joint (caused by insufficient heat or solder)

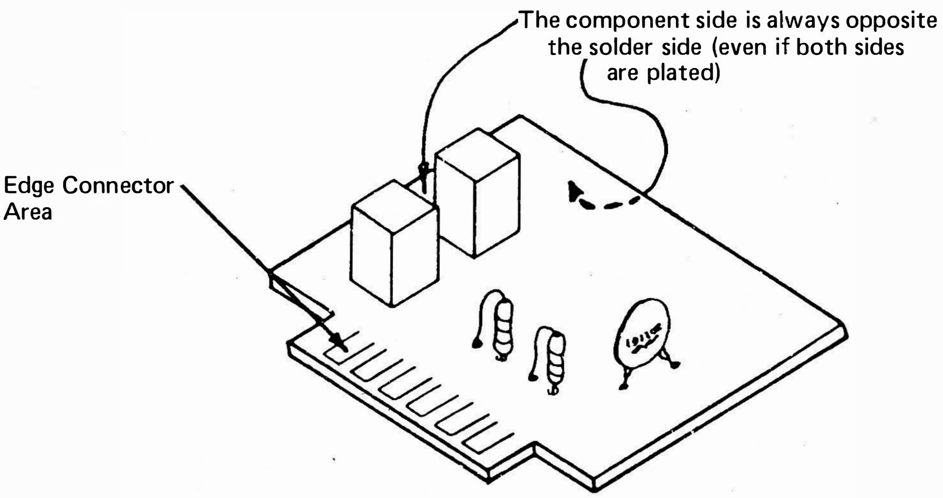


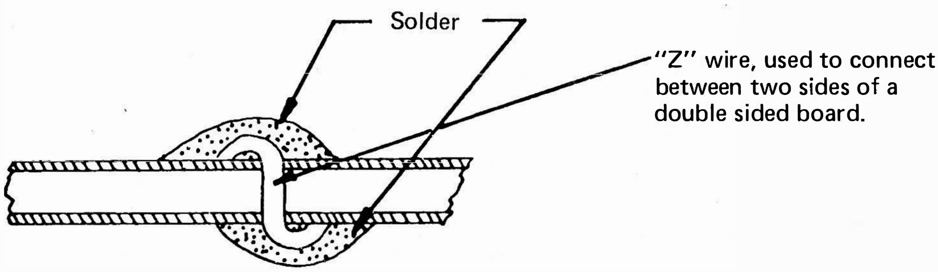
CIRCUIT TRACE REPAIR

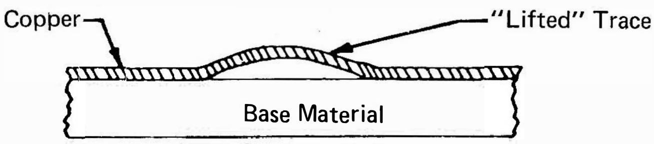
Most of the printed circuit boards used in the FT-208R are single sided boards. However, occasionally a double sided board is used in situations where high shielding is required. A comparison of the two types is shown below.



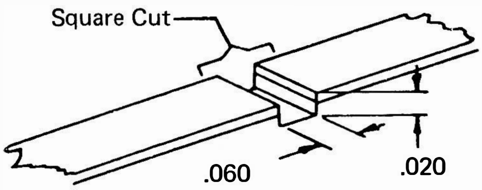








If you have previously lifted a trace, make an etch cut on each side of the lifted trace, and install a wire bridge as shown in the drawing.



Coat Cut Area With Eastman 910

TROUBLESHOOTING

A FUNDAMENTAL ANALYSIS OF THE TROUBLE

The failure may be caused by one of the following:

1) Mechanical defect
2) Electrical defect
3) Others (Murphy's Law, etc.)

1. MECHANICAL DEFECTS

Typical mechanical defects encountered by the technician are:

a) Damage from shock during transportation (remember the unit was probably subjected both to sea and truck shipment).
b) Damage caused by vibration in service.
c) Damage caused by forcing stubborn knobs or switches. This difficulty is usually proceded by one of the above two defects.

2. ELECTRICAL DEFECTS

Typical electrical defects encountered are:

a) Part(s) failure(s) caused by aging.
b) Failures caused by improper application of supply voltage, or by voltage spikes. An improper fuse in use could cause extensive damage to be sustained.
c) Improper operation (e.g. transistors without load – this usually points to failure elsewhere, in addition to the damaged transistor of IC).
d) Loose connections at the power connector or elsewhere caused by cold solder joints, etc.

3. OTHERS

Among the miscellaneous types of failures or difficulties encountered are:

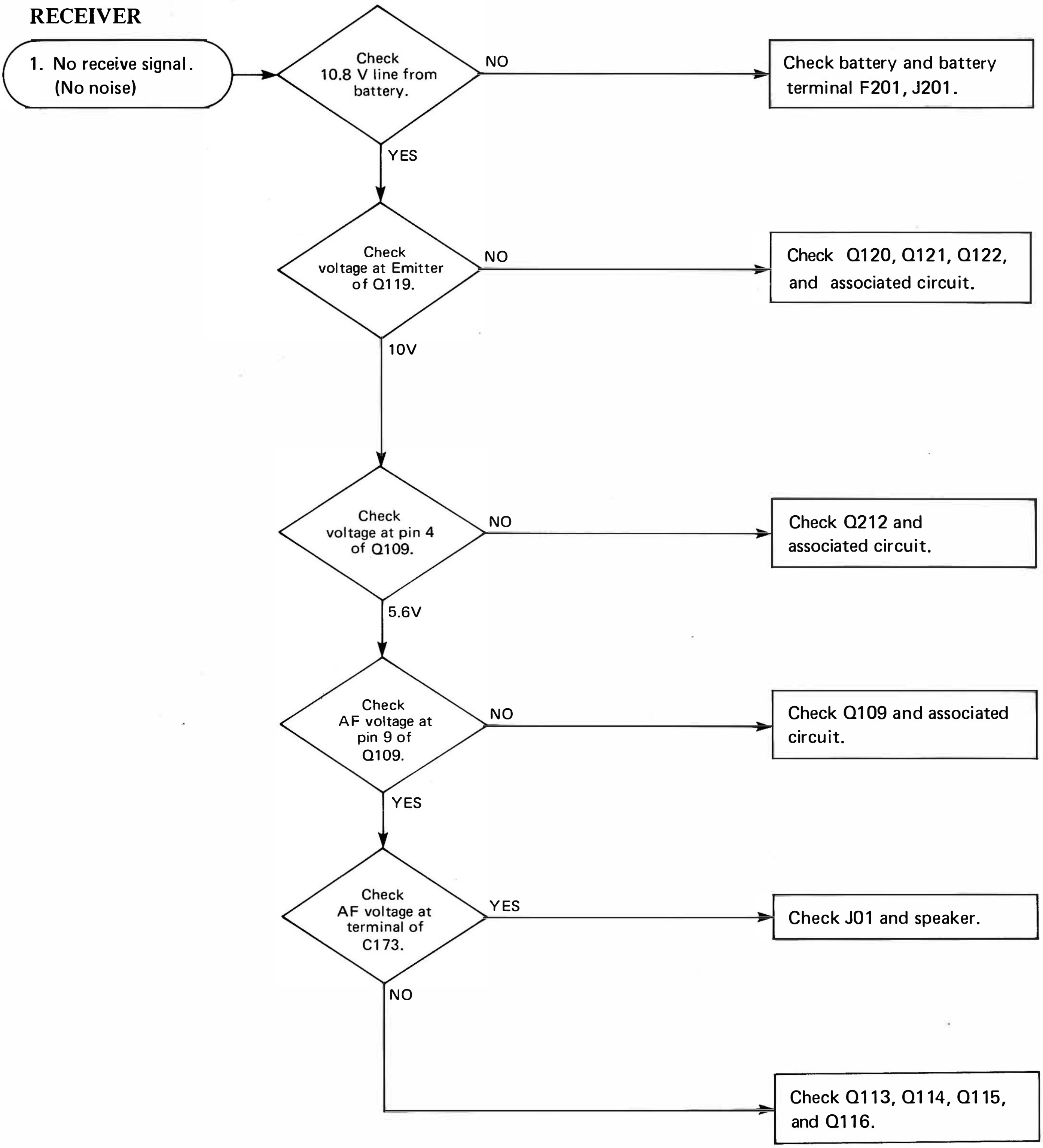
a) Antenna troubles – poor connectors, use of cheap coax not made to withstand weather, and sabotage by neighbors (nail driven through coax, etc.).
b) "Cockpit error:" including mislabeled coax lines to coax switch, or attempt to use transceiver on frequencies other than those it was designed for.
c) Murphy's Law: use of a non-Yaesu microphone with different connections, for example (See page 1-10)

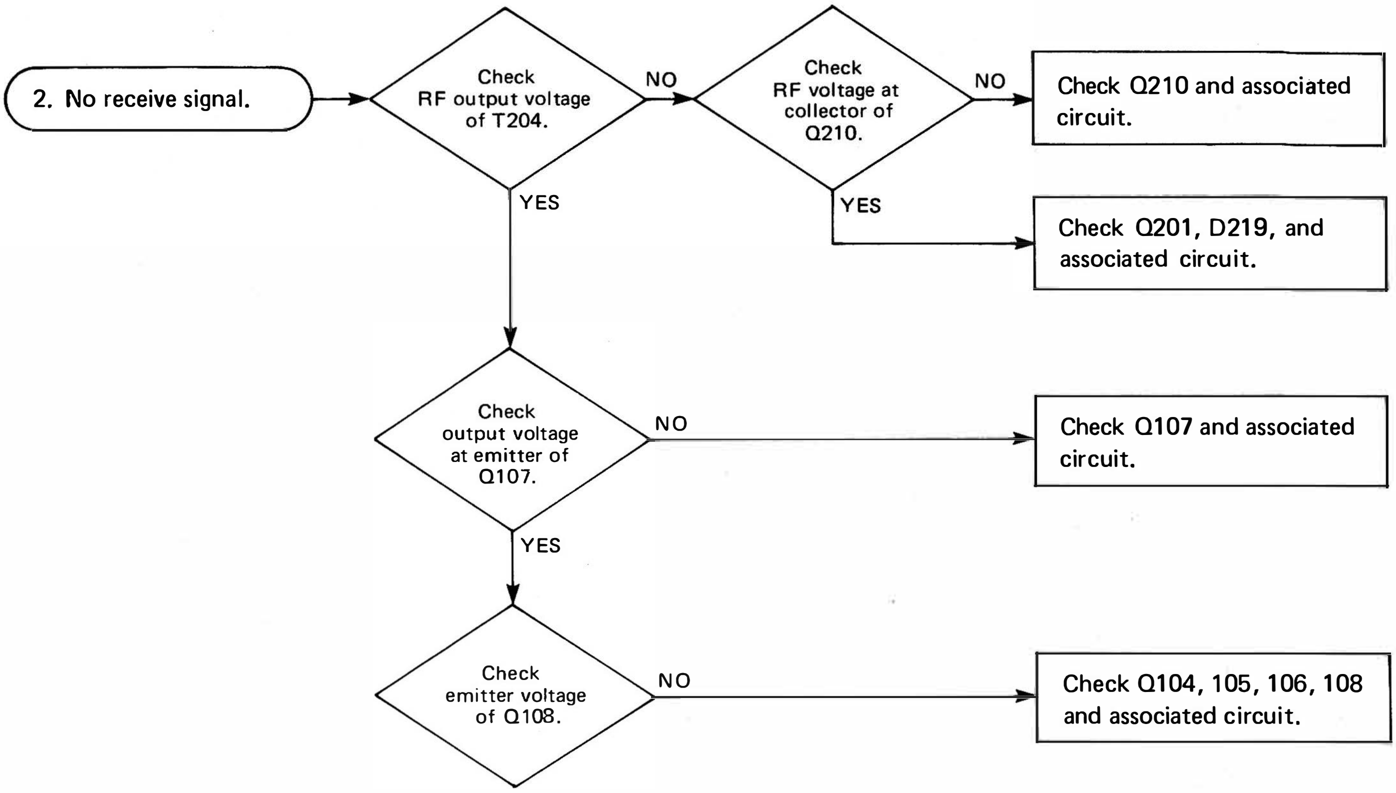
TYPICAL PART FAILURES, CAUSES, AND SYMPTOMS

PARTS	CAUSE OF TROUBLE	SYMPTOMS
Semiconductors (IC, FET, TR)	High supply voltage Open circuit Excessive drive High temperature	Short or open circuit Output decreases to 1/2 at 80° C Internal noise Instability
MOS FET MOS IC	Static electricity	Total failure
Crystal Crystal filter	Shock High temperature	Crystal destroyed Frequency drift Filter bandpass change
Resistor	Excessive power Aging High temperature	Component burned Value changed Open circuit
Potentiometer	Excessive power Shock	Component burned Open circuit Noise Unsmooth rotation
Capacitor	Excess voltage High temperature Excess power	Shorted Leakage Open/decreased capacitance
Variable capacitor Trimmer capacitor	Ratings exceeded Dust between plates Shock, forced rotation	Shorted Leakage Unsmooth rotation
Coils	Ratings exceeded Variation	Open or short circuit Leakage or shorted turns Detuned
Switch	Ratings exceeded Aging	Poor contact Unsmooth operation Open circuit
Relay	Ratings exceeded Humidity	Poor contact Noise Coil open

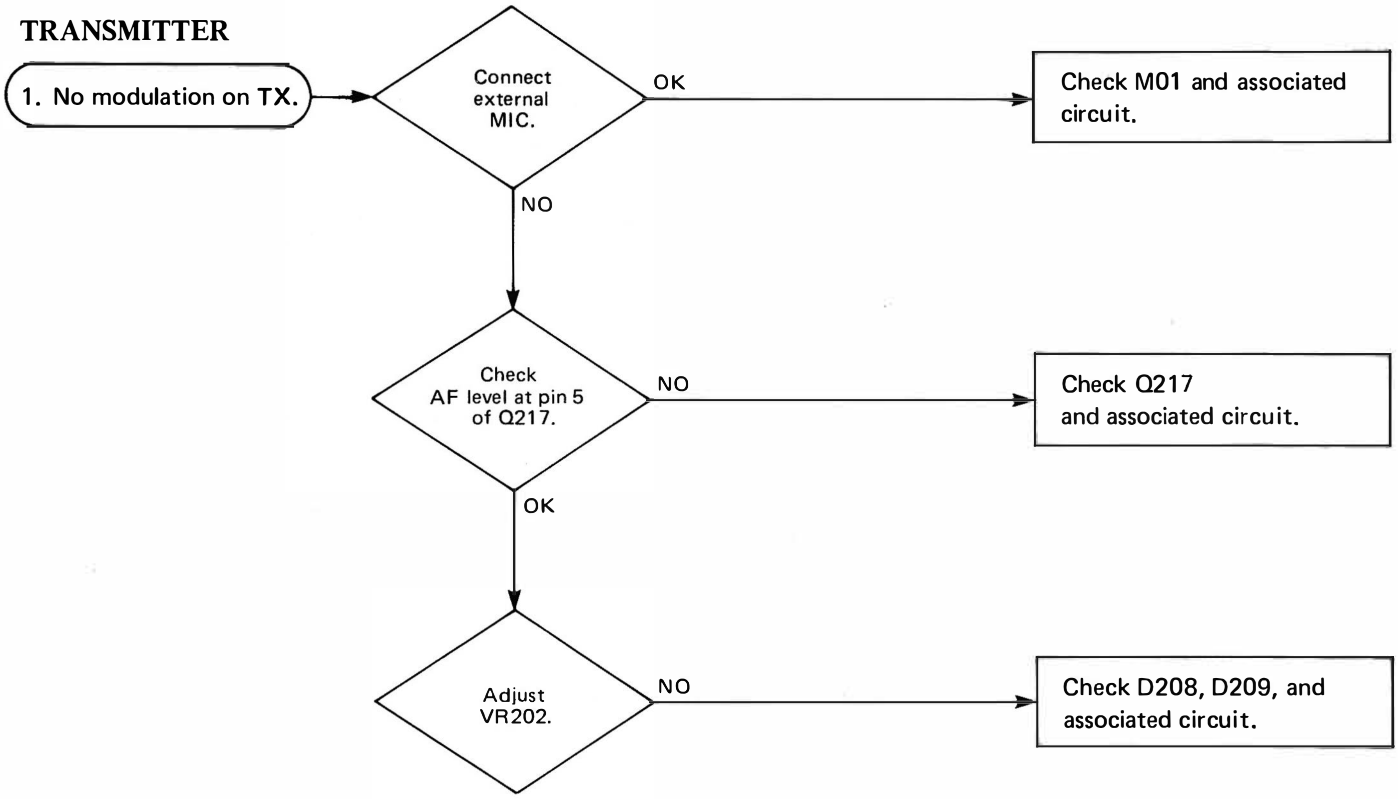
FAULT TREE

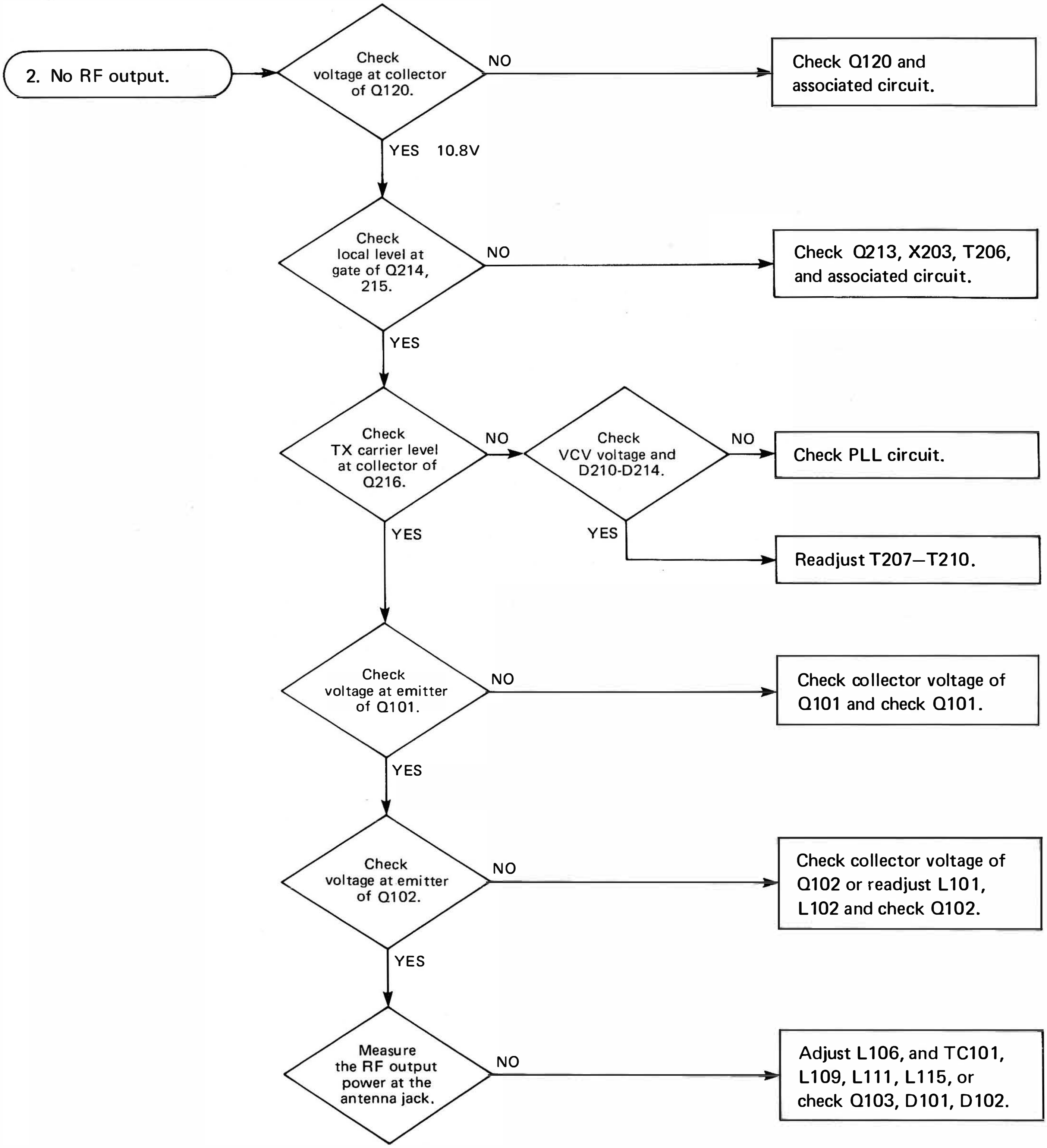
RECEIVER

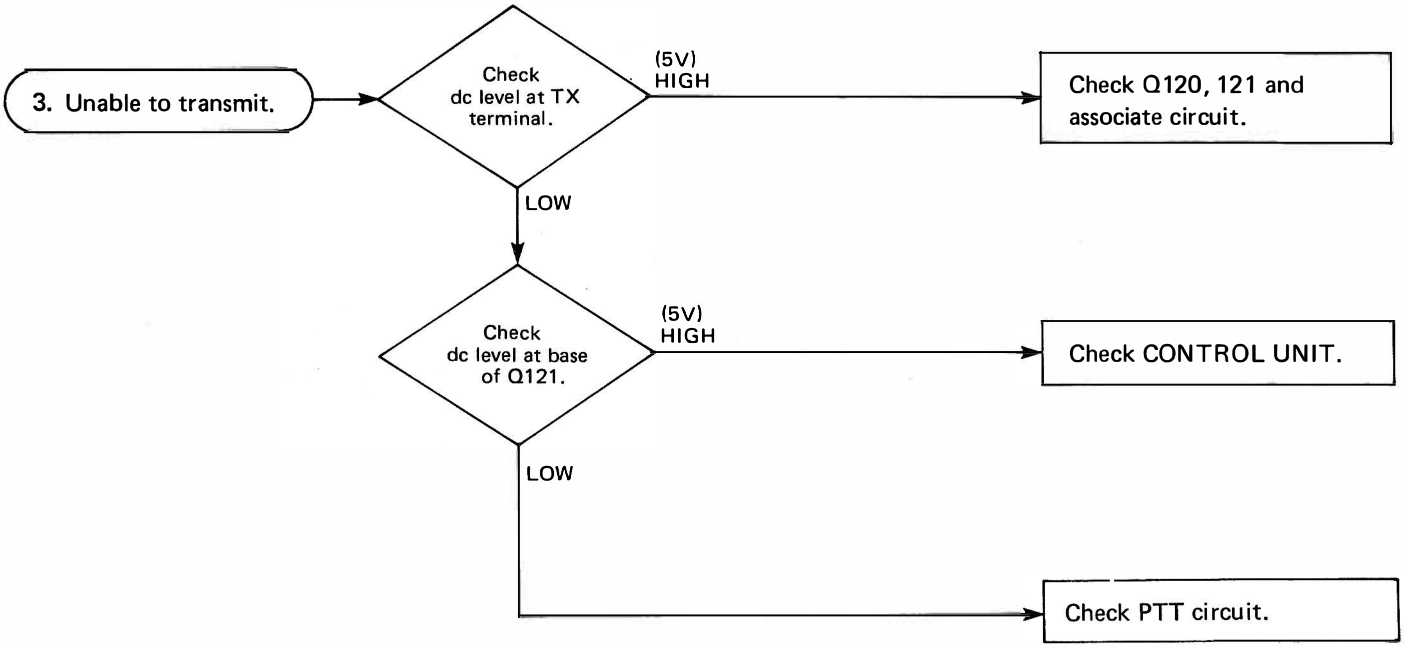



2. No receive signal.
Check RF output voltage of T204.
NO
Check RF voltage at collector of Q210.
NO
Check Q210 and associated circuit.
YES
Check Q201, D219, and associated circuit.
YES
Check output voltage at emitter of Q107.
NO
Check Q107 and associated circuit.
YES
Check emitter voltage of Q108.
NO
Check Q104, 105, 106, 108 and associated circuit.

TRANSMITTER




2. No RF output.
Check voltage at collector of Q120.
NO
Check Q120 and associated circuit.
YES 10.8V
Check local level at gate of Q214, 215.
NO
Check Q213, X203, T206, and associated circuit.
YES
Check TX carrier level at collector of Q216.
NO
Check VCV voltage and D210-D214.
NO
Check PLL circuit.
YES
Readjust T207–T210.
YES
Check voltage at emitter of Q101.
NO
Check collector voltage of Q101 and check Q101.
YES
Check voltage at emitter of Q102.
NO
Check collector voltage of Q102 or readjust L101, L102 and check Q102.
YES
Measure the RF output power at the antenna jack.
NO
Adjust L106, and TC101, L109, L111, L115, or check Q103, D101, D102.


3. Unable to transmit.
Check dc level at TX terminal.
(5V) HIGH
Check Q120, 121 and associate circuit.
LOW
Check dc level at base of Q121.
(5V) HIGH
Check CONTROL UNIT.
LOW
Check PTT circuit.

SECTION 4—REPAIR PARTS

ORDERING FORMS

If you live in the United States, you may order parts from Yaesu Electronics Corporation. In other countries, you should order parts from the Yaesu agent for your country. In countries where Yaesu is not currently represented, you may order spare parts directly from Yaesu Musen Company, Ltd. in Tokyo.

When ordering, please specify the exact model number of the transceiver that the part is for. Many parts are standard, such as resistors and disc ceramic capacitors, but you should use particular care when ordering such items as electrolytics, tantalum capacitors, and the like.

The parts list to follow identifies the board that the parts belong to, as well as the circuit designation and part description. A "Part Number" is also specified, and this number will allow immediate identification by our parts department of the item you require. (**See example below.)

Shipment of parts from Yaesu USA is usually made by UPS, COD. Allow at least a week for the parts department to process your order. You will receive prompt notification that your order has been received, and if parts are back ordered, or if additional information is required, you will be so informed.

PARTS ORDER EXAMPLE

QUANTITY	TRANSCEIVER IDENTIFICATION	LOCATION	**PART NUMBER	CIRCUIT DESIGNATION
1	FT-208R	PB-2276	G3325120	Q101 2SC2512

(cut here)

YAESU MUSEN COMPANY, LTD. – C.P.O. BOX 1500, TOKYO, JAPAN
YAESU ELECTRONICS CORPORATION – P.O. Box 49, Paramount, CA 90723
YAESU ELECTRONICS CORPORATION – 9812 Princeton-Glendale Rd., Cincinnati, OH 45246

ORDER BLANK

QUANTITY	TRANSCEIVER IDENTIFICATION	LOCATION	PART NUMBER	CIRCUIT DESIGNATION

I authorize shipment via: ☐ Best Way ☐ Parcel Post ☐ UPS ☐ Other

Ship To:
(Print or Type)

Name: ______________________

Address: ______________________

City: ______________ State: __________ Zip: __________

Country: ______________________

YAESU MUSEN COMPANY, LTD. – C.P.O. BOX 1500, TOKYO, JAPAN
YAESU ELECTRONICS CORPORATION – P.O. Box 49, Paramount, CA 90723
YAESU ELECTRONICS CORPORATION – 9812 Princeton-Glendale Rd., Cincinnati, OH 45246

ORDER BLANK

QUANTITY	TRANSCEIVER IDENTIFICATION	LOCATION	PART NUMBER	CIRCUIT DESIGNATION

I authorize shipment via: ☐ Best Way ☐ Parcel Post ☐ UPS ☐ Other

Ship To: (Print or Type)
Name: ____________________
Address: ____________________
City: ____________ State: ________ Zip: ________
Country: ____________________

. . . .
(cut here)

YAESU MUSEN COMPANY, LTD. – C.P.O. BOX 1500, TOKYO, JAPAN
YAESU ELECTRONICS CORPORATION – P.O. Box 49, Paramount, CA 90723
YAESU ELECTRONICS CORPORATION – 9812 Princeton-Glendale Rd., Cincinnati, OH 45246

ORDER BLANK

QUANTITY	TRANSCEIVER IDENTIFICATION	LOCATION	PART NUMBER	CIRCUIT DESIGNATION

I authorize shipment via: ☐ Best Way ☐ Parcel Post ☐ UPS ☐ Other

Ship To: (Print or Type)
Name: ____________________
Address: ____________________
City: ____________ State: ________ Zip: ________
Country: ____________________

PARTS LIST

MAIN CHASSIS

Symbol No.	Part No.	Description
		RESISTOR
R01	J01215101	Carbon film 1/8W TJ 100Ω
R02*	J20336180	Metallic film MOR 2P 2W 18Ω
(Low power 1W)		
		CAPACITOR
C01	K02175180	Ceramic disc 50WV CH 18pF (DD104CH80J50V02)
C03	K10186102	" " 63WV B 0.001μF (RD870-1B102K63V)
C05	K41120476	Electrolytic 16WV 47μF (16TL47)
C04	K40129007	" " 100μF (16RE100)
		INDUCTOR
L01	L0020334	
		SWITCH
S01	N6090025	SST(C) 12-04V
S02	N0190080A	JRA-1-12-9 (with PB-2207A)
S03	N4090040	KHG10901
S05 (S04)	N4090041	KHC10904
S06	N5090006	KEA5A021
		RECEPTACLE
J01	P1090201	UK-0002
J02	P1090052	SR30-10R-6S
J03	P1090191	UG-625B/U
		CONNECTOR
P1 (with wire)	T9204050	Housing 3021-05
		MICROPHONE
MIC1	M3290001	EM-76
		SPEAKER
SP1	M4090050	VS-40A 8Ω 0.1W
		CABLE
	T9204090	
		LITHIUM BATTERY
BAT301	Q9000106	CR2025
		IC
Q109	G1090145	MC3357P
		TRANSISTOR
Q116,120	G3109500Y	2SA950Y
Q111,114,117	G3111750E	2SA1175E
Q102	G3320530	2SC2053
Q115,119	G3321200Y	2SC2120Y
Q103	G3321960	2SC2196
Q101	G3325120	2SC2512
Q104	G3325490	2SC2549
Q110,112,113, 118,121,122	G3327850E /F	2SC2785E/F
Q105	G3327860L	2SC2786L
Q106–108	G3327870L	2SC2787L
		DIODE
D108,109	G2090027	Si 1SS53
D106	G2015550	" 1S1555
D101,102	G2090033	" MI301
D107	G9090017	Varistor MV-11
		CRYSTAL
X101	H0102419	HC-18/T 17.355MHz (Model A,D,E)
X101	H0102406	HC-18/T 16.445MHz (Model B,C)
		FILTER
XF101	H1102033	16M15A18T
CF101,102	H3900030	LF-B15
		RESISTOR
R161,162	J00215279	Carbon Film 1/8W VJ 27Ω
R112	J00215100	" " " " 10Ω
R109	J01215100	" " " TJ 10Ω
R169	J20336390	Metallic " 2W 39Ω
R104	J01215470	Carbon " 1/8W TJ 47Ω
R156	J00215560	" " " VJ 56Ω
R133	J00215101	" " " " 100Ω
R160	J00215121	" " " " 120Ω
R148	J00215151	" " " " 150Ω
R107,159	J00215221	" " " " 220Ω
R172	J01215221	" " " TJ 220Ω
R171	J10246221	" Composition 1/4W GK 220Ω
	J00215271	" Film 1/8W VJ 270Ω
R101,158	J00215331	" " " " 330Ω
R115	J02245471	" " 1/4W SJ 470Ω
R102,130,144, 155	J00215102	" " 1/8W VJ 1kΩ
R103	J10246102	" Composition 1/4W GK 1kΩ
R108,139	J00215152	" Film 1/8W VJ 1.5kΩ
R125,128,132, 134,157,166	J00215222	" " " " 2.2kΩ
R165	J10246222	" Composition 1/4W GK 2.2kΩ
R118	J00215332	" Film 1/8W VJ 3.3kΩ
R140,141,145	J00215472	" " " " 4.7kΩ

MAIN UNIT

Symbol No.	Part No.	Description
PB-2276A	F0002276A	Printed Circuit Board
	C0022760	P.C.B. with Components

Ref. No.	Part No.	Description
R168	J10246472	Carbon Composition 1/4W GK 4.7kΩ
R124,142	J00215562	" Film 1/8W VJ 5.6kΩ
R150,152	J00215103	" " " " 10kΩ
R151	J01215103	" " " TJ 10kΩ
R122,138	J00215153	" " " VJ 15kΩ
R126,147	J00215183	" " " " 18kΩ
	J00215223	" " " " 22kΩ
	J01215333	" " " TJ 33kΩ
R129	J00215333	" " " VJ 33kΩ
R136,164	J00215473	" " " " 47kΩ
R135	J00215513	" " " " 51kΩ
R143	J00215683	" " " " 68kΩ
R153	J10246823	" Composition 1/4W GK 82kΩ
R146	J10246152	" " " " 100kΩ
R149,163	J00215104	" Film " VJ 100kΩ
R127,131	J00215124	" " 1/8W " 120kΩ
R117	J00215184	" " " " 180kΩ
R154	J00215224	" " " " 220kΩ
R167	J10246224	" Composition 1/4W GK 220kΩ
R137	J00215274	" Film 1/8W VJ 270kΩ
R123	J00215474	" " " " 470kΩ
		POTENTIOMETER
VR101(with S101)	J60800091	EVJLKBP 15A24 20KΩA
VR102(with S102)	J60800090	EVJLKBP 15B53 5KΩB
VR103	J51745103	H0651A013-10KB 10KΩB
		CAPACITOR
C136	K00182010	Ceramic Disc 63WV SL 1pF (RD870-1SL-1R0C63V)
C119,124,142	K00182030	" " " " 3pF (RD870-1SL-3R0C63V)
C128	K07183060	" " " " 6pF (RD870-1N150-6R0D63V)
C130,134,137	K07183070	" " " " 7pF (RD870-1N150-7R0D63V)
C129,133,155	K00183100	" " " " 10pF (RD870-1SL-100D63V)
C110,127	K02185120	" " " CH 120F (RD870-1NPO120J63V)
C176	K00185120	" " " SL 12pF (RD870-1SL-120J63V)
C148	K00185150	" " " " 15pF (RD870-1SL-150J63V)
C120	K00185180	" " " " 18pF (RD870-1SL-180J63V)
C101,106,118	K00185220	" " " " 22pF (RD870-1SL-220J63V)
C123	K00185330	" " " " 33pF (RD870-1SL330J63V)
C149	K06185330	" " " UJ 33pF (RD870-1N750-330J63V)
C125	K00185390	" " " SL 39pF (RD870-1SL-390J63V)
C150	K06185470	" " " UJ 47pF (RD871-1N150-470J63V)
C107,111	K00185560	" " " SL 56pF (RD871-1SL-560J63V)
C117	K00185820	" " " SL 82pF (RD871-1SL-820J63V)

Ref. No.	Part No.	Description
C102–105,108, 114,121,122,126, 140,141,147,157, 160,161,174,175	K10186102	Ceramic Disc 63WV B 0.001μF (RD870-1B102K63V)
C132,144,146,151	K14180103	" " " " 0.01μF (RD871-1FZ-103Z63V)
C163,169	K19149013	" " 25WV X 0.01μF (UAT05X103K-L05AE)
C154,156	K19149017	" " " " 0.022μF (UAT06X223K-L45AE)
C109,113,177,178	K23140005	" Chip 50WV 0.001μF (GR40W5R102M)
C153,172	K23170008	" Disc " 0.1μF (RPE110F104Z50V)
C162,164	K40179002	Electrolytic " 0.1μF (50RC2-R1)
C166	K40179001	" " 1μF (50RC2-1)
C145,158	K40129012	" 16WV 10μF (16RC2-10)
C173	K40129007	" " 100μF (16RE100)
C168,170	K40109002	" 10WV 47μF (10RE47)
C152	K70127225	Tantalum 16WV 2.2μF (CS15E1C2R2M)
C159	K70127475	" " 4.7μF (CS15E1C4R7M)
C112,115	K70127106	" " 10μF (CS15E1C100M)
		INDUCTOR
L113	L1190105	FL3H-1R0M 1μH
L101,104	L1020686	
L103,105,110	L1020677	
L114	L1020687	
L102	L0020748	
L106	L0020423	
L107	L0020728	
L108	L0020726	
L109	L0020987A	
L111	L0020342	
		TRANSFORMER
T103	L0020907	
T101	L0020984	
T102	L0020985	
T105,106	L0020986	
T107	L0020887	
		SWITCH
S101		With VR101
S102		With VR102
		COIL SHIELD CASE
	L9190016	
		TP TERMINAL
	Q5000036	TPG

PLL UNIT

Symbol No.	Part No.	Description
PB-2204D	F0002204D	Printed Circuit Board
	C0022040	P.C.B. with Components
		IC
Q206	G1090237	μPD2819C
Q217	G1090072	μPC577H
Q220(EU Model)	G1090239	TC5082P
		FET
Q207	G3801840Y	2SK184Y
Q201	G3801920Y	2SK192Y
Q214,215,218	G3801930F P K	2SK193F.P.K.
		TRANSISTOR
Q208,211,212,219	G3327850E /F	2SC2785E/F
Q202–205,209, 210,213,216	G3327860L	2SC2786L
		DIODE
D204,205,207,215, 216,219,220	G2090027	Si 1SS53
D218	G2090003	" V06B
D201	G2090107	Varactor 1T25
D202,210–214	G2090109	" 1SV69
D209	G2090179	" FC53
D208	G9090005	Varistor MV-103
D206	G2090178	Zener HZ6B-1L
D217	G2090181	" HZ7B-1L
D221	G2090138	Schottky ERA-81-004
		CRYSTAL
X201	H0102408	HC-18/T 5.76MHz Model A,D,E
X201	H0102409	HC-18/T 7.2MHz Model B,C
X202	H0102403	HC-18/T 125.595MHz Model A,D,E
X202	H0102405	HC-18/T 124.5875MHz Model B,C
X203	H0102407	HC-18/T3P 16.9MHz
X204	H0101982	HC-18/T 7.168MHz Model B,C,D,E
		RESISTOR
R234	J10246220	Carbon Composition 1/4W GK 22Ω
R221	J10246470	" " " " 47Ω
R211,259	J00215560	" Film 1/8W VJ 56Ω
R205,208,212,213, 241	J00215101	" " " " 100Ω
R265,266	J00215221	" " " " 220Ω
R248	J10246221	" Composition 1/4W GK 220Ω
R202,215	J00215331	" Film 1/8W VJ 330Ω
R223	J00215391	Carbon Film 1/8W VJ 390Ω
R257	J00215561	" " " " 560Ω
R207,230	J00215102	" " " " 1kΩ
R261	J00215122	" " " " 1.2kΩ
R239,251,258	J00215152	" " " " 1.5kΩ
R222,224	J00215182	" " " " 1.8kΩ
R210,225,232,240, 254	J00215222	" " " " 2.2kΩ
R255,256,263	J00215272	" " " " 2.7kΩ
R204	J00215332	" " " " 3.3kΩ
R216	J01215472	" " " TJ 4.7kΩ
R253	J00215472	" " " VJ 4.7kΩ
R264	J00215562	" " " " 5.6kΩ
R235	J00215103	" " " " 10kΩ
R226	J00215123	" " " " 12kΩ
R237	J00215333	" " " " 33kΩ
R236,252	J00215563	" " " " 56kΩ
R238,262	J00215683	" " " " 68kΩ
R201,247	J00215104	" " " " 100kΩ
R233,246	J01215104	" " " TJ 100kΩ
R218–220,250	J10246104	" Composition 1/4W GK 100kΩ
R260	J01215154	" Film 1/8W TJ 150kΩ
R206,209	J00215224	" " " VJ 220kΩ
R214	J01215224	" " " TJ 220kΩ
R242–245,249	J10246224	" Compotiion 1/4W GK 220kΩ
R228,231	J00215334	" Film 1/8W VJ 330kΩ
R203	J00215474	" " " " 470kΩ
R217	J00215105	" " " " 1MΩ
		POTENTIOMETER
VR202	J51745332	H0651A010-3.3KB 3.3kΩB
		THERMISTOR
TH201	G9090008	31D-26
		CAPACITOR
C264	K00182059	Ceramic disc 63WV SL 0.5pF (RD870-1SL-0R5C63V)
C209	K02182010	" " " CH 1pF (RD870-1NP01R0C63V)
C212	K00182020	" " " SL 2pF (RD870-1SL-2R0C63V)
C262,265,269	K02182030	" " " CH 3pF (RD870-1N150-3R0C63V)
C201	K06182040	" " " UJ 4pF (RD870-1N7504R0C63V)
C256	K04182040	" " " " 4pF (RD870-1N150-4R0C63V)
C202,205,229	K06182050	" " " " 5pF (RD870-1N750-5R0C63V)
C263,266,270	K06183060	" " " " 6pF (RD870-1N750-6R0D63V)
C235	K04183090	" " " PG 7pF (RD870-1N150-9R0D63V)
C203	K02183080	" " " CH 8pF (RD870-1NPO-8R0D63V)
C204,206,257,258	K06183080	" " " UJ 8pF (RD870-1N750-8R0D63V)

Symbol No.	Part No.	Description
C236	K06183090	Ceramic disc 63WV UJ 9pF (RD870-1N750-9R0D63V)
C210,232	K04185120	" " " PG 12pF (RD870-1N150-120J63V)
C234,261,293	K00185150	" " " SL 15pF (RD870-1SL-150J63V)
C214	K00185220	" " " " 22pF (RD870-1SL-220J63V)
C224,225,294	K00185330	" " " " 33pF (RD870-1SL-330J63V)
C252	K07179013	" " " " 33pF (RD871-2N150-330J63V)
C253	K04185330	" " " PG 33pF (RD871-1N150-330J63V)
C231	K06189006	" " " UJ 68pF (RD871-2N750-680J63V)
C246–248	K06185331	" " " " 330pF (RD874-2N750-331J63V)
C208,211,217,233, 237,238,249,254. 255,259,260,268, 271,283,284,286, 288,289,291,292, 296,299,0300, 0312	K10186102	" " " B 0.001μF (RD870-1B102K63V)
C215,219,223,241, 242,244,251,275, 290	K14180103	" " " FZ 0.01μF (RD871-1FZ-103Z63V)
	K13179002	" " " " 0.022μF (2222-662-02223)
C213,220,221,228, 295,297	K19149013	" " " X 0.01μF (UAT05X103K-L05AE)
C281,282	K19149019	" " 25WV X 0.033μF (UAT08X333K-L45AE)
C274	K23170006	" " 50WV 0.047μF (RPF112C473K50)
C0301,0303,0313	K23140005	" Chip " 0.001μF (GR40W5R102M)
C273	K70167104	Tantalum 35WV 0.1μF (CS15E1V0R1M)
C272	K70127225	" 16WV 2.2μF (CS15E1C2R2M)
C222	K70127475	" " 4.7μF (CS15E1C4R7M)
C226,227	K70127685	" " 6.8μF (CS15E1C6R8M)
C216	K70127106	" " 10μF (CS15E1C150M)
C218,250,287	K70107106	" 10WV 10μF (CS15E1A100M)
C277	K70087106	" 6.3WV 10μF (CS15E0J100MIS)
C240	K40179005	Electrolytic 50WV 0.47μF (50RC2-R47)
C207,245,276, 278–280,285	K40129012	" 16WV 10μF (16RC2-10)
C243	K40109009	" 10WV 33μF (10RC2-33)
C239,0314	K40129002	" 16WV 47μF (16RE47)
		TRIMMER CAPACITOR
TC201	K91000029	ECV-1ZW20X53 20pF

Symbol No.	Part No.	Description
		INDUCTOR
L202	L1190108	FL3H-R68M 0.68μH
L201	L1190105	FL3H-1R0M 1μH
L203	L1190019	FL5H-150K 15μH
L206	L1190115	S-154K 150mH
L204	L0020978	
L205	L0020745B	
		TRANSFORMER
T201	L0020904	
T202–204	L0020747	
T205	L0020905	
T206	L0020906	
T207–210	L0020907	
		SWITCH
S201	N6090026A	SSS212005
		CONNECTOR
J201	P0090187	DCP-20
J202	P1090127	2.5EJ1
		FUSE
F201	Q0000022	MFA-5 5A
		TP TERMINAL
	Q5000036	TP-G

CONTROL UNIT


Symbol No.	Part No.	Description
PB-2337A	F0002337A	Printed Circuit Board
	C0023370	P.C.B. with Components
		IC
Q301	G1090345	HD44820-A07
Q302	G1090346	TP0401
Q303	G1090126	MC14069B
Q304	G1090330	MK5087
		DISPLAY LCD
DS301	G6090021	HI301
		DIODE
D301–305,308, 309	G2090027	Si 1SS53
D306	G2090118	Schottky Barrier 1SS97
D311	G2090182	Zener HZ7A-2
D310	G2090175	LED SR-535D
D312	G2090173	LED SG235D
		CRYSTAL
X301	H0102320	HC-18/T 3.579545MHz

Symbol No.	Part No.	Description
		RESISTOR
R309	J01215471	Carbon Film 1/8W TJ 470Ω
R310	J01215152	〃 〃 〃 〃 1.5kΩ
R313	J01215222	〃 〃 〃 〃 2.2kΩ
R316	J01215332	〃 〃 〃 〃 3.3kΩ
R304	J01215472	〃 〃 〃 〃 4.7kΩ
R305,314,315	J01215562	〃 〃 〃 〃 5.6kΩ
R301	J00215104	〃 〃 〃 VJ 100kΩ
R303	J01215104	〃 〃 〃 TJ 100kΩ
R311,312	J01215224	〃 〃 〃 〃 220kΩ
R302	J00215684	〃 〃 〃 VJ 680kΩ
R306	J01215824	〃 〃 〃 TJ 820kΩ
R307,308	J00215105	〃 〃 〃 VJ 1MΩ
		THERMISTOR
TH301	G9090016	33D-28
		CAPACITOR
C305	K10186471	Ceramic Disc 63WV B 470pF (RD870-1B471K63V)
C302,304	K10186102	〃 〃 〃 〃 0.001μF (RD870-1B102K63V)
C306	K19149009	〃 〃 X 0.0047μF (UAT05X472K-L05AE)
C307	K19149013	〃 〃 〃 0.01μF (UAT05X103K-L05AE)
C301	K70127335	Tantalum 16WV 3.3μF (CS15E1C3R3M)
C303	K40129012	Electrolytic 〃 10μF (16RC2-10)
		LAMP
PL301	Q1000046	BQ031-30103A

ACCESSORIES

Symbol No.	Part No.	Description
	Q3000005	Antenna YHA-14
	Q9000088	Battery Pack FNB-2
	M4190001	Ear Phone
	Q9000070	Battery Charger NC-9A
	R7068220	
	R7048792B	
	S5000013	


MEMO



MODEL A

NOTES

1. ALL DIODES ARE 1SS53 UNLESS OTHERWISE NOTED.
2. ALL RESISTORS ARE IN 1/8W UNLESS OTHERWISE NOTED.
3. ALL CAPACITORS ARE IN μF UNLESS OTHERWISE NOTED
4. ALL ELECTROLYTIC CAPACITORS ARE 16WV UNLESS OTHERWISE NOTED.



FT-208R

CIRCUIT DIAGRAM

MODEL B,C,D,E

NOTES

1. ALL DIODES ARE 1SS53 UNLESS OTHERWISE NOTED
2. ALL RESISTORS ARE IN 1/8W UNLESS OTHERWISE NOTED.
3. ALL CAPACITORS ARE IN μF UNLESS OTHERWISE NOTED
4. ALL ELECTROLYTIC CAPACITORS ARE 16wv UNLESS OTHERWISE NOTED.

YAESU

E3690982A(8205-N)